

00005996



Department of Energy

ROCKY FLATS OFFICE  
P.O. BOX 928  
GOLDEN, COLORADO 80402-0928

93-DOE-13757

DEC 14 1993

Mr. Gary Baughman  
Hazardous Materials and Waste Management Division  
Colorado Department of Health  
4210 E. 11th Avenue  
Denver, Colorado 80220

Dear Mr. Baughman:

The U. S. Department of Energy is submitting the enclosed information to clarify and supplement information previously submitted with the Change to Interim Status in support of Solar Evaporation Pond Sludge removal and from discussions in informal weekly meetings.

EG&G has supplied the Division with reports that form the actual basis for our engineering decisions on the project. We had anticipated that inclusion of the CDH representatives at our weekly meetings would provide a forum for CDH to question technical experts involved in the project, thereby facilitating the Division's review. Perhaps future interactions can be improved by a review of how well this forum has functioned for the Division staff and what changes would be beneficial for future, similar projects.

Responses to your letter of November 26, 1993 are enclosed. We appreciate your prompt attention to our request for the changes to Interim Status to support the Accelerated Sludge Removal Project and closure of the Solar Evaporation Ponds. We anticipate our staffs will continue to work together directly on these changes. DOE is anxious to receive the Division's approval as soon as possible. We would like to bring our technical experts down to meet with your staff as necessary to assist them in reviewing the enclosed information and the DOE request for changes to Interim Status. Please let us know when it would be convenient for your staff to meet with us and what disciplines they would like us to bring. You may also contact me at 966-4538, or Debbie Mauer, Waste Operations (RCRA permitting), 966-5598 for further discussion.

Sincerely,

A handwritten signature in cursive script, reading "Frazer R. Lockhart", is written over the typed name.

Frazer R. Lockhart  
SEP Program Manager  
Environmental Restoration Division

Reviewed for Classification/UCNI/000  
By: Janet Nesheim, Derivative Classifier  
DOE, EMCBC  
Date: 10-14-08  
Confirmed Unclassified, Not UCNI/not 000

0004-588



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Fraser R. Lockhart  
SEP Program Manager  
Environmental Restoration Division

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93-DOE-13757  
Mr. Gary Baughman

2

Enclosures

- A Response to November 26 letter item-by-item
- B Response to 6 CCR 1007-3 Subpart J
- C Calculations of Pad Support Adequacy
- D Draft Report of Hydrostatic Testing and Acceptance Inspection
- E Fabrication and Installation Package--Tanks, Vents, Leak Detection

cc w/o Enc:

- S. Howard, RFO (w/o Enc)
- D. Mauer, RFO (w/o Enc)
- S. Keith, EG&G (w/o Enc)
- K. London, EG&G (w/o Enc)

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# **NOTICE:**

The following pages had not been numbered for this document when originally printed. If replacement pages are distributed, they will be microfilmed and included in the Administrative Record file.

The Administrative Record Staff

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The Administrative Record Staff

## Enclosure A

### Response to November 26 letter item-by-item

The following responses are grouped by the same topics and numbers as used in the Division's letter of November 26, 1993. We have attached our draft plans for several of the items, and will provide the final plans with our certification of the tank system.

#### I. EXAMPLES OF ADDITIONAL INFORMATION from page 2 of the CDH letter

Rocky Flats staff has reviewed the Interim Status section of the regulations, 6 CCR 1007-3 Part 265 Subpart J, referenced in the Division's letter. At the Division's suggestion, we have provided a paragraph-by-paragraph response to summarize how those requirements will be met (Attachment B). The Division has requested more detail, and in response to the specific items in your letter:

- (1) The sufficiency of the tanks' structural integrity will be supplied via an independent certification of the tank system (per 100.12(d)). Fabrication calculations and installation information are provided in Attachment G. The tank structural calculations have not changed and are the same calculations provided to your staff earlier. The Division further requested information on how the tanks are "acceptable" for storing the hazardous waste. As relates to compatible materials of fabrication, a corrosion study that addresses compatibility has been supplied to the Division. This report was prepared to support engineering decision-making, and was used in choosing the tanks.
- (2) The vent system is not ancillary equipment, since no pond waste is expected to enter the vents and the pond wastes are not volatile. The vent system is a conservative, preventative measure required by the plant's Industrial Hygiene organization, but is not required for protection against air-borne radioactivity. There are no filters in the system. The system serves no RCRA-compliance function.
- (3) The sufficiency of the tanks' structural integrity will be documented via an independent certification of the tank system (per 100.12(d)). The engineering calculations for the pad support capability are provided in Attachment C.
- (4) A daily inspection will be performed, as is required by regulation. Since the tanks' secondary containments are open at the top, the inspection will be a direct, visual inspection of the secondary containment, looking down from the top. In the future, we plan to replace the visual inspections with an automatic leak-detection system, as included in Attachment E.

#### (Flowchart 1) Overall Tank System Process

We understand that Flowchart 1 shows the input required to obtain the independent certification (PE Installation Certification) required by section 100.12(d). DOE has provided a paragraph-by-paragraph explanation of how we will meet each of the section 265 regulations referenced. We have discussed tightness-testing with your staff, including vendor-site hydrostatic test and additional testing after the tanks are sited. We propose that the independent certification be accepted as documentation of the adequacy of vendor-site testing. The draft testing plan is provided in Attachment D.

Please note that the citations in the flowchart to 100.41(b)(vi-vii) refer to meeting the requirements of 264.192 and 264.193. The analogous sections applicable to Interim Status are 265.192 and 265.193. Details of how the tank installation, including secondary containment,

## Enclosure A

### Response to November 26 letter item-by-item

The following responses are grouped by the same topics and numbers as used in the Division's letter of November 26, 1993. We have attached our draft plans for several of the items, and will provide the final plans with our certification of the tank system.

#### I. EXAMPLES OF ADDITIONAL INFORMATION from page 2 of the CDH letter

Rocky Flats staff has reviewed the Interim Status section of the regulations, 6 CCR 1007-3 Part 265 Subpart J, referenced in the Division's letter. At the Division's suggestion, we have provided a paragraph-by-paragraph response to summarize how those requirements will be met (Attachment B). The Division has requested more detail, and in response to the specific items in your letter:

- (1) The sufficiency of the tanks' structural integrity will be supplied via an independent certification of the tank system (per 100.12(d)). Fabrication calculations and installation information are provided in Attachment G. The tank structural calculations have not changed and are the same calculations provided to your staff earlier. The Division further requested information on how the tanks are "acceptable" for storing the hazardous waste. As relates to compatible materials of fabrication, a corrosion study that addresses compatibility has been supplied to the Division. This report was prepared to support engineering decision-making, and was used in choosing the tanks.
- (2) The vent system is not ancillary equipment, since no pond waste is expected to enter the vents and the pond wastes are not volatile. The vent system is a conservative, preventative measure required by the plant's Industrial Hygiene organization, but is not required for protection against air-borne radioactivity. There are no filters in the system. The system serves no RCRA-compliance function.
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#### (Flowchart 1) Overall Tank System Process

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Please note that the citations in the flowchart to 100.41(b)(vi-vii) refer to meeting the requirements of 264.192 and 264.193. The analogous sections applicable to Interim Status are 265.192 and 265.193. Details of how the tank installation, including secondary containment,

will meet the regulations cited have been discussed in the weekly meetings and are summarized as follows:

265.192 (a) Owner operators must submit a written assessment at the time of submittal of Part B information, per section 100.12(d).

DOE plans to obtain the assessment prior to commencing operation of the tanks under Interim Status. Due to DOE's aggressive schedule goals, the assessment will probably be done in several steps, each step covering a block of tanks. DOE will make that assessment available to CDH as soon as it is available. It is likely that the equipment and staff will be available to begin moving wastes out of the 207-B Pond into the first block of tanks within days of completing the assessment on that first block of tanks.

The assessment will contain the information, as applicable, as required in §265.192 (a)(1) through (6).

(b) The independent assessment will be used to document inspection for the specified items: weld breaks, punctures, scrapes, cracks, corrosion, damage or inadequate construction/installation. Any discrepancies found will be corrected on the tank showing the discrepancy prior to that tank being placed into service. Please note that each tank can be operated independently from the other tanks.

(c) Does not apply: The tanks are above-ground tanks.

(d) The tank system will be tested for tightness. The draft plan is provided in Attachment D.

(e) No ancillary equipment will be included in the tank system. The tanks will be filled via the use of a temporarily-attached hose running to a tanker-truck. Should any ancillary equipment be found to be needed, such equipment would be supported and protected against physical damage and stress.

Hose connections to a vent-system will be attached to the tanks (each tank is otherwise independently free-standing). The vent system is not intended to distribute, meter, or control the flow of the waste, and will not accumulate waste; the vent system therefore is not ancillary equipment per 260.10.

(f) Does not apply: The tanks are plastic.

(g) DOE will maintain a copy of the independent tank certification report as required by section 100.12(d). All plant-internal certifications generated during the installation of the tanks will also be maintained in the project file.

We have reviewed EPA's tank guidance (OSWER Policy Directive No. 9483.00-1) checklist on page 6-10. The checklist items that apply will be included in the independent certification of the tank system. The PE performing the certification will incorporate the items into the checklists he will use, which are much more extensive than the 6-10 checklist.

We propose that the certification of the tank system be used to document compliance with the requirements noted in Flowchart 1.

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The assessment will contain the information, as applicable, as required in §265.192 (a)(1) through (6).

(b) The independent assessment will be used to document inspection for the specified items: weld breaks, punctures, scrapes, cracks, corrosion, damage or inadequate construction/installation. Any discrepancies found will be corrected on the tank showing the discrepancy prior to that tank being placed into service. Please note that each tank can be operated independently from the other tanks.

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We propose that the certification of the tank system be used to document compliance with the requirements noted in Flowchart 1.

(Flowchart 2) Emergency Response Procedures

The flowchart cites requirements from section 265.196 and (for removal from service) 265.197. To summarize our plans for meeting these requirements:

265.196 Response to leaks or spills and disposition of unfit-for-use tank systems

- (a) Wastes will not be added to a leaking tank. The fill-line will be physically disconnected after the tank is filled.
- (b) If a leak is detected in a tank, waste will be pumped out of the effected tank into an empty tank installed for the purpose of receiving wastes from a leaking tank. There will be at least one such empty tank in each of the three tents housing the tank farm. If a tank leaks, sufficient waste will be removed within 24 hours from the leaking tank to prevent further release and allow inspection and repair. Material released into a secondary containment will be removed within 24 hours.
- (c) Any visible releases to the environment will be contained by operating staff, further migration to soils or surface water will be mitigated, and visible contamination will be removed, stored, and ultimately disposed properly. These activities will parallel existing pad operations.
- (d) Notification will be made as required and as documented in the plant's RCRA Contingency Plan.
- (e) The tank involved in the leak or release will be repaired or, if repairs are not possible, closed.
- (f) Should a major repair be required, the effected tank will be certified per Section 100.12(d) prior to return to service.

265.197 Closure and post-closure care

- (a) At closure of the tanks, requirements of Subpart G and Part 266 will be met.
- (b) Closure of the 750 Pad is already planned through the IAG. Remediation of soils below the pad will be included in pad closure at that time.
- (c) Does not apply: The tanks have secondary containment.

SUGGESTED CONDITIONS from page 3 of the CDH letter

- (1) DOE intends to provide a certification per 100.12(d) to fulfill the assessment mentioned here. Design drawings and specifications will be included. As-built drawings will be available to the Division in the project files at Interlocken as soon as they are completed. We propose that, due to the simplicity of the installation, the Division can accept the assessment and certification without waiting for the as-builts.
- (2) We appreciated the Division's pointing out that DOE assumes a risk in procuring and installing the tanks prior to receiving the Division's approval. We have accepted this risk because DOE finds the potential to accelerate emptying the ponds a sufficient off-setting benefit.

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- (3) DOE intends to provide a certification per 100.12(d). We request the Division plan the necessary approval documentation to minimize waiting-time once that certification is complete. While the Division has the best understanding of how to streamline the process, we have suggested to your staff that a conditional approval to the change to Interim Status could be issued that stipulates DOE will commence operation only after the certification has been delivered to the Division. To expedite operations, we may submit the certification for a block of tanks first, and follow up with certification for the rest of the tanks as they are installed.
- (4) Manufacturers certification and data sheets will be supplied with the certification.
- (5) We have reviewed the need for coupons and found that coupons are unnecessary due to the excellent compatibility of the tank material with the waste to be stored. Please refer to the corrosion study supplied to your staff. We anticipate your review of the corrosion study will provide the information needed for the Division to concur. If you would like to discuss this issue further, we suggest that the Division approve the change to Interim Status for the sludge in pond 207-B and defer resolution on coupons for pond 207-C.
- (6) We will not store wastes exceeding 1.9 specific gravity in full tanks. Blending truck loads is one technique we will use if higher specific gravity material is encountered. We would also like the option of underfilling selected tanks at the discretion of the staff performing the transfer to the tanks. This question refers only to waste from Pond 207-C, since there is no indication that any of the sludge in 207-B exceeds 1.9 specific gravity.
- (7) While DOE does conduct ultrasonic testing on some tanks, use of this method is not required (as CDH noted). Also, while our annual tank assessment is a useful tool, it is not regulatorily driven. DOE will incorporate the new tanks into our annual tank assessment if appropriate. Please note that, because of the nature of the molded tank fabrication, the tank walls are not uniform in thickness, so any assessment technique must take this into account.
- (8) No open flames will be in the area. Should any equipment, such as welding equipment, be needed in the tents, safety and access would be controlled by the plant's established safety and environmental control procedures. A natural-gas heater is currently installed in the tents, and is engineered and installed to meet fire-safety needs. We have disconnected the heater in tents #3 and #4, and will disconnect half the system in Tent #6 (the other half will remain in service) prior to installing the tanks. The system will be redesigned in the coming year. The heating system is useful for operator comfort, and is not required to ensure safe tank operation. Combustibles will be present on the pads as they are currently.
- (9) No filtration system for the vent is applicable. The vent system is a conservative measure to meet our Industrial Hygiene needs, is not required for protection from radioactivity, and is not a waste handling system.
- (10) The operating staff at the ponds has considerable experience with the odors generated during sludge consolidation in the 207-A&B impoundments. Based on this experience, we anticipate no controls will be necessary. The tanker-trucks that will be used to transport the sludge are equipped with filters which will control any particulates. (The sludge is wet, which will suppress dust generation.)
- (11) DOE invites the Division to review our sampling and analytical records as convenient. Records are kept at EG&G's Interlocken offices; please contact Frazer Lockhart (DOE, RFO: phone 966-4538) or Steve Keith (EG&G Rocky Flats: phone 966-8541).

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Appropriate documents are also entered into the Administrative Record. Based on verbal discussions with your staff, Attachment X provides information on the sampling used to obtain the characterization data provided to your staff.

- (12) The tanks are rated for personnel to stand on them, and could be walked on, if necessary, with the appropriate safety measures in place. In planning and performing maintenance activities, DOE provides for a safe and healthful workplace by complying with OSHA labor standards at CFR 29 1910 and 1926 and plant Health and Safety Practices as applicable. Ladders will be available to operations staff for their routine inspections and other work in the tents, and could also be used for maintenance access. Each maintenance task will be individually evaluated for the appropriate safety measures.
- (13) We have discussed tightness testing with your staff and the independent PE who will perform the tank system certification, and have reviewed ASTM standards. We have revised our plans for tightness testing, and now propose the following:
  - Primary tanks will be tested twice: Each primary tank will be filled with water and checked for leaks over a 30 minute period at the vendor site (by the vendor) and again at the 750 Pad after installation (by Rocky Flats staff).
  - Secondaries will be tested once: Each secondary will be filled with water and checked over a period of 30 minutes for leaks at the vendor site (by the vendor). Each secondary will be inspected for potential damage at Rocky Flats, but will not be re-tested.

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Enclosure B

**Response to 6 CCR 1007-3 Subpart J**

The following information was first provided to CDH staff on November 11, 1993, in support of DOE's request for changes to Interim Status for Rocky Flats Unit 25, the 750 Pad. The responses have been updated.

265.190 Applicability

This subpart applies, since DOE is requesting a change to interim status to store pond waste including free liquids in tanks.

265.191 Assessment of existing tanks

Does not apply: The tanks in the request are new tanks.

265.192 Design and installation of new tank systems or components

(a) Owner operators must submit a written assessment at the time of submittal of Part B information, per section 100.12(d).

DOE plans to obtain the assessment prior to commencing operation of the tanks under Interim Status. Due to DOE's aggressive schedule goals, the assessment will probably be done in several steps, each step covering a block of tanks. DOE will make that assessment available to CDH as soon as it is available. It is likely that the equipment and staff will be available to begin moving wastes out of the 207-B Pond into the first block of tanks within days of completing the assessment on that first block of tanks.

The assessment will contain the information, as applicable, as required in §265.192 (a)(1) through (6).

(b) The independent assessment will be used to document inspection for the specified items: weld breaks, punctures, scrapes, cracks, corrosion, damage or inadequate construction/installation. Any discrepancies found will be corrected on the tank showing the discrepancy prior to that tank being placed into service. Please note that each tank can be operated independently from the other tanks.

(c) Does not apply: The tanks are above-ground tanks.

(d) The tank system will be tested for tightness prior to being placed in use. Any leaks found will be repaired prior to that effected tank being placed in service.

The tank tightness will be tested as follows: Both the primary and secondary of each tank will be leak-tested with water at ambient pressure by the vendor at the vendor's location. Each primary will be nested inside its respective secondary, in the configuration to be installed, and wrapped by the vendor prior to shipment to Rocky Flats Plant. After installation, the outer surfaces of each tank (that is, the secondary) will be visually inspected for signs of damage. After placement in the proper tent, each primary will be re-tested with water at ambient pressure. Any deficiencies will be corrected in the effected tank prior to putting the tank into service.

Enclosure B

**Response to 6 CCR 1007-3 Subpart J**

The following information was first provided to CDH staff on November 11, 1993, in support of DOE's request for changes to Interim Status for Rocky Flats Unit 25, the 750 Pad. The responses have been updated.

265.190 Applicability

This subpart applies, since DOE is requesting a change to interim status to store pond waste including free liquids in tanks.

265.191 Assessment of existing tanks

Does not apply: The tanks in the request are new tanks.

265.192 Design and installation of new tank systems or components

(a) Owner operators must submit a written assessment at the time of submittal of Part B information, per section 100.12(d).

DOE plans to obtain the assessment prior to commencing operation of the tanks under Interim Status. Due to DOE's aggressive schedule goals, the assessment will probably be done in several steps, each step covering a block of tanks. DOE will make that assessment available to CDH as soon as it is available. It is likely that the equipment and staff will be available to begin moving wastes out of the 207-B Pond into the first block of tanks within days of completing the assessment on that first block of tanks.

The assessment will contain the information, as applicable, as required in §265.192 (a)(1) through (6).

(b) The independent assessment will be used to document inspection for the specified items: weld breaks, punctures, scrapes, cracks, corrosion, damage or inadequate construction/installation. Any discrepancies found will be corrected on the tank showing the discrepancy prior to that tank being placed into service. Please note that each tank can be operated independently from the other tanks.

(c) Does not apply: The tanks are above-ground tanks.

(d) The tank system will be tested for tightness prior to being placed in use. Any leaks found will be repaired prior to that effected tank being placed in service.

The tank tightness will be tested as follows: Both the primary and secondary of each tank will be leak-tested with water at ambient pressure by the vendor at the vendor's location. Each primary will be nested inside its respective secondary, in the configuration to be installed, and wrapped by the vendor prior to shipment to Rocky Flats Plant. After installation, the outer surfaces of each tank (that is, the secondary) will be visually inspected for signs of damage. After placement in the proper tent, each primary will be re-tested with water at ambient pressure. Any deficiencies will be corrected in the effected tank prior to putting the tank into service.

(e) Ancillary equipment will be supported and protected against physical damage and stress. Since the tanks will be filled via the use of a temporarily-attached hose (probably running to a tank truck) there will be no ancillary equipment.

Hose connections to a vent-system will be attached to the tanks (which are otherwise each independently free-standing). The vent system is not intended to distribute, meter, or control the flow of the waste, and will not accumulate waste; the vent system therefore is not ancillary equipment per 260.10.

(f) Does not apply: The tanks are plastic.

(g) DOE will maintain a copy of the independent tank certification report as required by section 100.12(d). All plant-internal certifications generated during the installation of the tanks will also be maintained in the project.

#### 265.193 Containment and detection of releases

(a) Secondary containment is an integral part of the tanks. The primary will be nested in the secondary as shipped by the vendor and will be in place prior to the tanks being placed in service. All the tanks to be used are new tanks.

(b) The secondary containment is a second shell around the primary tank, and will prevent any material that may leak from a tank-primary from contacting soil, ground water, or surface water. A leak detection system will be installed, but initially when the tanks are placed in service, leak-detection will be accomplished via visual inspections once per day.

(c) The minimum requirements for secondary containment will be achieved.

The secondary containment is fabricated from the same material as the primary tank and is compatible with the pond wastes to be stored; has sufficient strength to withstand the head pressure it could be exposed to (which will be ambient pressure since the tanks are vented to the atmosphere); and will withstand exposure to the wastes, ambient conditions (the tanks can withstand exposure to sunlight and freezing), and stresses of daily operation (daily operations will be similar to those currently underway on the 750 Pad).

The pad on which the tanks will be placed is capable of providing support to the tank system.

Initially, leaks from the primary will be detected via a visual inspection once per day. A failure in the secondary containment of the tanks will be detected via a visual inspection once per day. Automatic leak detection for the primary will be installed within the secondary containment in the future; no automatic detection of leaks from the secondary is planned.

Provisions will be made such that material accumulating in the secondary containment can be removed, probably by pumping into a container and returning the material to one of the tanks or to the Building 374 treatment system as convenient. We anticipate that liquid detected in a tank's secondary containment can be removed within 24 hours.

The secondary containment is considered to be a liner external to the tank: There is a separate, stand-alone secondary containment for each tank; the secondary container is designed to contain 100% of the tank capacity; will prevent run-on water from entering the secondary containment (the secondary is fabricated from an open-top tank and the

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location of the tanks inside a tent will prevent direct entry of precipitation into the secondary containment); the secondary will be fabricated from a single molded piece and will therefore be free of cracks and gaps; and the secondary will surround the tank completely on the bottom and sides (but not the top), preventing both lateral and vertical migration of any waste that might leak into the secondary. (The secondary would also meet the requirements for a vault, though the regulations imply that vaults are constructed of concrete, while the tank secondaries are fabricated of the same plastic as the primary tanks.)

(f) No ancillary equipment is included in the tank system. The tanks will be filled using a tanker truck. Only a vent system will be connected to the tanks, which are otherwise each independently free-standing. The vent system is not intended to distribute, meter, or control the flow of the waste, and will not accumulate waste or condensate from the waste. The vent system therefore is not ancillary equipment per 260.10.

(g) DOE feels the proposed tank system meets the requirements of this section as described above, and seeks no variance.

(h) DOE feels the proposed tank system meets the requirements of this section as described above, and seeks no variance.

#### 265.194 General operating requirements

(a) The pond wastes to be placed in the tank system will not cause the tanks to fail. DOE has provided the Division with the tank fabrication drawings and calculations.

(b) Appropriate controls will be used to prevent spills and overflows from the tanks: The fill-connections on the tanks will be physically disconnected after each tank is filled; overfill protection during filling will be provided by attended operation; no wave or wind action or precipitation inflow is anticipated since the tanks will be located inside a tent; and should a leak or spill occur, the requirements of Section 265.196 will be met.

#### 265.195 Inspections

(a) A schedule for inspection of the tank system will be developed and implemented. The tank system inspection will be an extension of the existing inspections that are performed on the pad, modified to provide for daily tank inspections. Once a tank is filled, the fill-line will be physically disconnected.

(b) The daily inspection will include the mandated items: detection of corrosion or release of waste; data gathering from monitoring or leak detection equipment; and inspection of accessible areas of the tanks and area around the tanks for erosion or signs of release.

(c) Does not apply: Cathodic protection systems are not present.

(d) Records of the inspections will be maintained following established plant policy.

#### 265.196 Response to leaks or spills and disposition of unfit-for-use tank systems

(a) Wastes will not be added to a leaking tank. The fill-line will be physically disconnected after the tank is filled so no inadvertent transfer of waste into the tank will be possible.

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(b) If a leak is detected in a tank, waste will be pumped out of the effected tank into an empty tank which will be installed for the purpose of receiving wastes from a leaking tank. There will be at least one such empty tank in each of the three tents housing the tank farm. If a tank leaks, sufficient waste will be removed within 24 hours from the leaking tank to prevent further release and allow inspection and repair. Material released into a secondary containment will be removed within 24 hours.

(c) Any visible releases to the environment will be contained by operating staff, further migration to soils or surface water will be mitigated, and visible contamination will be removed, stored, and ultimately disposed properly. These activities will parallel existing pad operations.

(d) Notification will be made as required and as documented in the plant's RCRA Contingency Plan.

(e) The tank involved in the leak or release will be repaired or, if repairs are not possible, closed.

(f) Should a major repair be required, the effected tank will be certified per Section 100.12(d) prior to return to service.

265.197 Closure and post-closure care

(a) At closure of the tanks, requirements of Subpart G and Part 266 will be met.

(b) Closure of the 750 Pad is already planned through the IAG. Remediation of soils below the pad will be included in pad closure at that time.

(c) Does not apply: The tanks have secondary containment.

265.198 Does not apply: The wastes to be stored are not ignitable nor reactive.

265.199 Does not apply: The wastes to be stored are not incompatible wastes.

265.200 Does not apply: New tanks will be installed, and no wastes were previously stored or treated in these tanks.

265.201 Does not apply: The plant is not a small generator.

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Enclosure C

Calculations of Pad Support Adequacy

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EG&G ROCKY FLATS CALCULATION COVER SHEET					18. CALC PAGE NO. Page <u>1</u> of <u>26</u>	
1. CALCULATION NO.		2. BLDG.	3. ROOM	4. FLOOR	5. SYSTEM ID	6. VSS
CALC-750-NA-000002		750	NA	NA	NA	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
7. JOB TITLE		8. JOB #		10. SYSTEM CATEGORY		
SLUDGE STORAGE TANK FOUNDATION		989179-05		<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4		
		9. <input type="checkbox"/> WCF <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> EJO				
CAT 1, 2, 3, 4		CAT 1, 2, 3, 4		APPROVALS SIGNATURES AS REQUIRED BY SYSTEM CATEGORY		
11. Note 1	12. Note 2	13. Note 3 & 5	14. Note 4	15.	16.	17.
PREPARER(S) / DATE(S)	CHECKER(S) / DATE(S)	INDEPENDENT VERIFIER(S) / DATE(S)	DESIGN ENG. MANAGER / DATE(S)	REV. NO. OR NEW CALC. NO.	SUPERSEDES CALC. NO. OR REV. NO.	CONFIRMATION REQUIRED (✓) YES NO
J.K. Goodall 11/8/93	A. BARTNIK 11.11.93	NA	J.P. Moore 11/12/93	0	NA	✓

UNCONTROLLED COPY

Note 1: The signer assures that the correct technical requirements to ensure a safe design are included in this document.

Note 2: The signer assures that the calculation is administratively correct, in the proper format and technically correct.

Note 3: The signer verifies that the technical content, use of design inputs, assumptions, and specificity are correct and support the conclusions reached by the calculation.

Note 4: The signer accepts responsibility for all of the elements contained in this calculation and that the person who completed the calculation was/is technically competent to do so.

Note 5: Independent verifiers shall indicate methods used to verify calculations (i.e., calculation checks, technical review, alternate calculation (must be attached), etc.)

6.4-1-1(1) 3/31/92

REVIEWED FOR CLASSIFICATION/UCNI  
By [Signature]  
Date 11/11/93

EG&G ROCKY FLATS CALCULATION COVER SHEET					18. CALC PAGE NO. Page <u>1</u> of <u>26</u>	
1. CALCULATION NO.		2. BLDG.	3. ROOM	4. FLOOR	5. SYSTEM ID	6. VSS
CALC-750-NA-000002		750	NA	NA	NA	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
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PREPARER(S) / DATE(S)	CHECKER(S) / DATE(S)	INDEPENDENT VERIFIER(S) / DATE(S)	DESIGN ENG. MANAGER / DATE(S)	REV. NO. OR NEW CALC. NO.	SUPERSEDES CALC. NO. OR REV. NO.	CONFIRMATION REQUIRED (✓) YES NO
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[illegible]

[illegible]

<b>EG&amp;G ROCKY FLATS</b>		<b>CALCULATION SUMMARY SHEET</b>		<b>CALC PAGE NO.</b> Page 3 of 26	
CALCULATION NO: <u>CALC-750-NA-000002</u>		REV: <u>0</u>		JOB #: <u>989179-05</u>	
<b>ASSUMPTIONS AND TECHNICAL BASIS FOR THEM</b>  <p>The primary assumption of this calculation is that the modulus of subgrade of the entire soil strata is 50 psi per inch of displacement. This value conservatively envelopes known in-situ conditions typical of the geotechnical media at Rocky Flats Plant. Other assumptions and their technical basis are identified throughout the calculation.</p>					
REF. NO.	INPUTS/REFERENCES				
1	Marks' Standard Handbook for Mechanical Engineers, Eight Edition, Baumeister Avallone, and Baumeister, McGraw-Hill, 1978.				
2	Mechanics for Engineers, Statics and Dynamics, Third Edition, Ferdinand P. Beer and E. Russell Johnston, Jr.				
3	UCRL-CR-106554, Structural Concepts and Details for Seismic Design. subjected to natural phenomena hazards.				
4	Rocky Flats Plant Standard No. SC-106, Standard for Equipment Seismic Qualification.				
5	Concrete Floors on Grade, Ralph E. Spears, Portland Cement Association, 1978				
6	Finite Element Stress Analysis for "SLUDGE TANKS" Rocky Flats Plant by Lane Engineers, Inc., Tulare, California, November 4, 1993.				
7	Technical Provisions for Plant Paving Improvements FY 93-94 Site				

<b>EG&amp;G ROCKY FLATS      CALCULATION SUMMARY SHEET</b>		<b>CALC PAGE NO.</b> Page 3 of 26
CALCULATION NO: <u>CALC-750-NA-000002</u>	REV: <u>0</u>	JOB #: <u>989179-05</u>
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EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 4 of 26	
CALCULATION NO: CALC-750-NA-000002		REV.: 0		JOB #: 389179-05	
PREPARED BY: J. K. Gooden 1/8/93		CHECKED BY: A. BARTNIK		MAY 11, 1993	
SUBJECT: SLUDGE STORAGE TANK FOUNDATIONS					

## OBJECTIVE

The objective of this calculation is to evaluate the ability of the 750 Pad Site to support sludge storage tanks that will be located inside existing tents on the pad.

## OVERVIEW

The primary sludge storage tanks are 13'-3 in diameter and are to be arranged in arrays within Tents 3, 4, and 6. The sludge storage tank has a capacity of 111,156 gallons. The storage containment tank has a greater capacity; however, the evaluation will be based on the primary tank because of the storage function and administrative controls on the volume. The specific gravity of the sludge is expected to be less than or equal to 1.9. The project has been categorized as Important or Low Hazard with respect to Natural Phenomena Hazards. The historic use of the 750 Pad, prior to the erection of the tents, was that of an asphalted parking lot. Reference Attachment 1 for tank arrangements and verification of other data cited in this overview.

## METHODOLOGY AND DISCUSSION

Even though the integrity of the sludge storage tanks are not part of the objective of this calculation, the factor of safety against overturning of the tank during a seismic event was evaluated and determined to be 9.68 (see calculation pages 8 and 9 for numerical calculations mentioned throughout this discussion). The lateral seismic forces were derived per the requirements of RFP Plant Standard No. SC-106, "Standard for Equipment Seismic Qualification". The zero period acceleration (ZPA) for the Important or Low Hazard categorization is 0.15 g. For a tank to approach a factor of safety against overturning of 1.0 the ZPA would need to exceed 1.45 g. These factors are based upon the tank behaving like a rigid body.

The sludge storage tanks will not be anchored. Calculations show that a coefficient of friction between the polyethylene tank bottom and the asphalt needs to be at least 0.201 to assure that there is a factor of safety against sliding (during a seismic event) of 1.5. Values for the static coefficient of friction for polyethylene on asphalt were not found. Lane Engineers (see reference 6) utilized a static coefficient of friction value for polyethylene on concrete of 0.27. Review of static friction values for other materials such as wood on wood, wood on metal, metal on metal, earth on earth (which range from 0.15 to 1.0, see references 1 & 2) indicate that it is most likely that high density polyethylene on asphalt values will easily exceed the requirement. Lack of anchorage of mechanical systems is the leading cause of system failures resulting from seismic events. In this situation there are no uplift forces and the system attachments to the tank are flexible vent

EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 4 of 26	
CALCULATION NO: CALC-750-NA-000002		REV.: 0		JOB #: 389179-05	
PREPARED BY: J. K. Gooden 1/8/93		CHECKED BY: A. BARTNIK		MAY 11, 1993	
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CALCULATION NO: CALC-750-NA-000002		REV.: 0		JOB #: 989179-05	
PREPARED BY: J. K. GODDARD 11/8/93		CHECKED BY: A. BARTNIK, RM		11.11.93	
SUBJECT: SLUDGE STORAGE TANK FOUNDATION					

1  
2 pipes. Usually the transfer of horizontal and vertical seismic forces to the  
3 foundation are resisted by direct anchorage; however, "An exception is unanchored  
4 storage tanks where limited uplift from code level forces is permitted if the  
5 attached piping and conduits have adequate flexibility." (to quote UCRL-CR-  
6 106554). In consideration of the above, we conclude that anchorage of the tanks  
7 is not a technical or administrative requirement.

8  
9 The evaluation also addressed the performance of the existing asphalt surface on  
10 which the sludge storage tanks will be placed. The loaded tank surface pressure  
11 is estimated not to exceed 9.24 psi. This pressure is not expected to exceed  
12 77.315 psi during a seismic event (which is less than the 90 psi tire inflation  
13 pressures required for compaction of the asphalt during placement). Soil bearing  
14 pressures immediately beneath the sub-grade are less than 2400 psf; which is  
15 acceptable for dynamic loadings. It is therefore concluded that contact pressures  
16 between the tank bottoms and the asphalt surface will not adversely affect the  
17 structural integrity of the asphalt layer nor the soil media below the asphalt sub-  
18 base. Asphalt does have visco-elastic characteristics which vary significantly with  
19 temperature. Radial visco-elastic flow of the asphalt from beneath the tanks should  
20 be expected over a period of time. This distortion of the asphalt should present  
21 itself as a "bulge" around the tank perimeter and will likely be accompanied with  
22 circumferential cracking of the asphalt. This behavior of the asphalt does not  
23 adversely affect stability and does in fact enhance sliding stability.

24 A walkdown of the asphalt surfaces within the tents was conducted on November  
25 4, 1993. It was observed during the walkdown that there are abrupt as-built  
26 offsets on the asphalt surface that approach 1 inch and that pallets supporting  
27 large. It was also noted that there are exposed, irregularly shaped, concrete slabs  
28 that asphalt has been placed around. Neither of these conditions are acceptable,  
29 in that these discontinuities can adversely affect tank performance. Heavy boxes  
30 were leaving acceptable indentations in the asphalt. This problem can be mitigated  
31 by not allowing tanks to be placed upon these irregularities/distortions or by  
32 demolishing these objects and providing a new bearing surface for the tank bottom.  
33 Tank locations should be identified via markings on the existing asphalt prior to an  
34 engineering walkdown. Bearing surfaces for tanks should then be reviewed and  
35 assessed by Structural Engineering on a case by case basis to determine the  
36 acceptability of the proposed tank bearing surface. Unacceptable locations shall  
37 be resurfaced. Existing concrete slabs shall be demolished and replaced with an  
38 asphalt surface that is "like-for-like" with respect to adjoining asphalt.

39 A report on a geotechnical subsurface investigation in the same location was  
40 reviewed. The report was by R.V. Lord and Associates, Inc. and is dated  
41 September 13, 1972. The boring of interest in this investigation shows a constant  
42 soil media to a depth of slightly more than 15 feet. The boring log describes the

EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 5 of 26	
CALCULATION NO: CALC-750-NA-000002		REV.: 0		JOB #: 989179-05	
PREPARED BY: J. K. GODDARD 11/8/93		CHECKED BY: A. BARTNIK, RM		11.11.93	
SUBJECT: SLUDGE STORAGE TANK FOUNDATION					

1  
2 pipes. Usually the transfer of horizontal and vertical seismic forces to the  
3 foundation are resisted by direct anchorage; however, "An exception is unanchored  
4 storage tanks where limited uplift from code level forces is permitted if the  
5 attached piping and conduits have adequate flexibility." (to quote UCRL-CR-  
6 106554). In consideration of the above, we conclude that anchorage of the tanks  
7 is not a technical or administrative requirement.

8  
9 The evaluation also addressed the performance of the existing asphalt surface on  
10 which the sludge storage tanks will be placed. The loaded tank surface pressure  
11 is estimated not to exceed 9.24 psi. This pressure is not expected to exceed  
12 77.315 psi during a seismic event (which is less than the 90 psi tire inflation  
13 pressures required for compaction of the asphalt during placement). Soil bearing  
14 pressures immediately beneath the sub-grade are less than 2400 psf; which is  
15 acceptable for dynamic loadings. It is therefore concluded that contact pressures  
16 between the tank bottoms and the asphalt surface will not adversely affect the  
17 structural integrity of the asphalt layer nor the soil media below the asphalt sub-  
18 base. Asphalt does have visco-elastic characteristics which vary significantly with  
19 temperature. Radial visco-elastic flow of the asphalt from beneath the tanks should  
20 be expected over a period of time. This distortion of the asphalt should present  
21 itself as a "bulge" around the tank perimeter and will likely be accompanied with  
22 circumferential cracking of the asphalt. This behavior of the asphalt does not  
23 adversely affect stability and does in fact enhance sliding stability.

24 A walkdown of the asphalt surfaces within the tents was conducted on November  
25 4, 1993. It was observed during the walkdown that there are abrupt as-built  
26 offsets on the asphalt surface that approach 1 inch and that pallets supporting  
27 large. It was also noted that there are exposed, irregularly shaped, concrete slabs  
28 that asphalt has been placed around. Neither of these conditions are acceptable,  
29 in that these discontinuities can adversely affect tank performance. Heavy boxes  
30 were leaving acceptable indentations in the asphalt. This problem can be mitigated  
31 by not allowing tanks to be placed upon these irregularities/distortions or by  
32 demolishing these objects and providing a new bearing surface for the tank bottom.  
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CALCULATION NO: CALC-750-NA-000002		REV.: 0		JOB #: 989179-05	
PREPARED BY: J.K. GOODALL 11/8/93		CHECKED BY: A. BARTNIK		BM 11.11.93	
SUBJECT: SLUDGE STORAGE TANK FOUNDATION					

soil as gravelly sandy clay - coarse, plastic, very stiff, moist, and medium brown in color. Erection of the tents required the placement of fill material, grading of the site, and placement of an asphalt surface; as did construction of the parking lots that were present at the site prior to the tents. Stephen R. Keith makes note of the fact that compaction during backfill operations was not subjected to rigorous quality control/assurance programs since the anticipated use of the finish grade surface was that of a parking lot and not for structural grade foundations. It is concluded that the sub-surface strata at the 750 Pad is comparatively "soft" with respect to other in-situ sub-surface conditions at RFP. The geotechnical report does not address allowable bearing pressure at the surface; however, there is supporting information available via reference 5. Table 1. ASTM Soil Classification System indicates that the allowable bearing pressure is 2000 psf or more and that the modulus of subgrade reaction ranges from 100 to 300 psi/inch.

Two dimensional behavior of the geotechnical media was also evaluated by utilizing the finite element capability of SAP90 (by Computers and Structures, Inc., Berkeley, California). A one foot thick slice, twenty feet deep and 100 hundred feet wide was modeled utilizing shell elements. The modulus of elasticity of the elements was calibrated so that if a 50 psi pressure were applied over a one square foot area on the "surface" of the model, a one inch displacement would occur (i.e., the vertical modulus of subgrade of the soil = 50 psi/inch). The resulting modulus of elasticity of the media was 1786 psi. Variations of Poisson's ratio were also addressed and no significant changes in surface displacements were found. The material characteristics form an analytical boundary that conservatively envelopes the in-situ conditions at the 750 Pad. Three different arrangements of tanks were analyzed (one tank, two tanks spaced two feet apart, and three tanks spaced five feet and two feet apart). The analysis input, plots of surface profiles, and plots with varying values of Poisson's ratio may be found within Attachment 2. The analysis results indicate that the largest vertical displacement is approximately 1.26 inches which leads to the conservative assumption that the largest differential displacement across the diameter of a tank is 1.26 inches. This differential displacement does not significantly contribute to instability of the tank. Based on this assessment, we conclude that the stability of the tank during a seismic event exceeds current design requirements.

Differential displacement resulting from loads applied to the geotechnical media coupled with a 2% grade does not adversely affect tank stability; however, long term positioning of a fully loaded tank in this manner could lead to degradation of the tank via creep and possible rupture. This technical question must be addressed in a review of the vendor's analysis of the tank.

EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 6 of 26	
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PREPARED BY: J.K. GOODALL 11/8/93		CHECKED BY: A. BARTNIK		BM 11.11.93	
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EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 7 of 26	
CALCULATION NO: CAL-750-NA-000002		REV.: 0	JOB #: 989179-05		
PREPARED BY: J. K. Goodman 11/8/93		CHECKED BY: A. BARTNIK 11/11/93			
SUBJECT: Sludge Storage Tank Foundation					

## CONCLUSIONS

As a result of this evaluation the following conclusions/recommendations are made:

1. Both the overturning and sliding stability of the sludge storage tanks during the design requirement seismic event is acceptable. In this case, seismic anchorage of the tanks is not required.
2. The bottoms of the tank will appear to have "sunk" into the asphalt over a long period of time. This will be caused by the visco-elastic characteristics of the asphalt coupled with the behavior of the geotechnical sub-grade. "Bulging" around the tank perimeter should be expected along with circumferential cracking of the asphalt. The behavior of the asphalt in this manner should not be interpreted as an expression of tank instability nor as failure of the subgrade or underlying geotechnical media.
3. Initial placement of the tanks shall include at least the following:
  - A. The construction effort shall permanently mark the existing asphalt surface to indicate the proposed locations of all tanks.
  - B. Structural Engineering shall walkdown all proposed tank locations after they have been marked by construction and determine which locations require upgrade of the tank bearing surface.
  - C. All tank bearing surfaces which require upgrade shall be upgraded in accordance with information presented on page 10 of this calculation.
4. Concrete slabs that fall within the bearing surface of a tank shall be demolished and replaced with asphalt and subgrade that is "like-for-like" with respect to adjacent asphalt.
5. The vendor's tank analysis shall be reviewed to assure that proper consideration of the tank being placed on a sloped surface has been made inclusive of creep considerations of the high density polyethylene.

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SUBJECT: SLUDGE STORAGE TANK FOUNDATION					

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CALCULATION NO: CALC-750-NA-000002		REV.: 0	JOB #: 989179-05		
PREPARED BY: J.K. GOODALL 11/6/93		CHECKED BY: A. BARTNICK 11-11-93			
SUBJECT: SLUDGE STORAGE TANK FOUNDATION					

1 (SEE ATTACHMENT 1 FOR SUPPORTING DATA)

2 TANK WEIGHT = 3800 LBS

3

4 CONTAINMENT TANK WEIGHT = 2700 LBS

5

6 TOTAL EMPTY WEIGHT = 6500 LBS

7

8 TANK CAPACITY = 11,156 GALLONS

9

10 TANK VOLUME =  $\frac{11,156 \text{ GALLONS}}{7.48 \text{ GALLONS/FT}^3} = 1,491.44 \text{ FT}^3$

11

12 SPECIFIC GRAVITY  $\rightarrow$

13 WEIGHT OF CONTENTS =  $1.9 \times 62.428 \text{ LBS/FT}^3 \times 1,491.44 \text{ FT}^3$

14

15 = 176,904.9 LBS

16

17 WEIGHT OF TANK & CONTENTS = 183,404.9 LBS

18

19 AREA OF TANK BASE =  $\pi \left(\frac{159}{2}\right)^2 = 19,855.7 \text{ IN}^2$

20

21 DEAD LOAD BASE PRESSURE =  $\frac{183,404.9 \text{ LBS}}{19,855.7 \text{ IN}^2}$

22

23 = 9,236.9 PSI

24

25 SEISMIC (FOR SC-106) IMPORTANT OR LOW HAZARD

26

27  $Z = 0.15$   $I = 1.25$   $C_i = 2.86$   $R_w = 4.0$

28

29  $\therefore F = 0.1341 \cdot W = 24,594.6 \text{ LBS}$

30

31 LET C.G. OF TANK & FLUID =  $\frac{122.5}{2} = 61.25 \text{ IN.}$

32

33 (WITH HIGH SPECIFIC GRAVITY (1.9) VISCOSITY OF

34 SLUDGE IS LOW,  $\therefore$  SLOSHING IS NOT A CONCERN)

35

36 OVERTURNING MOMENT = 1,506,419.1  $\text{#-IN.}$

37

38 RESTORING MOMENT = 14,580,689.6  $\text{#-IN.}$

39 (ARM = 79.5')

40 FACTOR OF SAFETY =  $\frac{M_R}{M_O} = 9.68$

41

42

EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 8 of 26	
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EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 9 of 26	
CALCULATION NO: CALC-750-NA-000002		REV.: 0		JOB #: 989179-05	
PREPARED BY: J.K. GOODALL 1/8/93		CHECKED BY: A. BARTNIK		11.11.93	
SUBJECT: SLUDGE STORAGE TANK FOUNDATION					

1 TANK BASE (ASSUME WALL THICKNESS OF UNITY)

2  $I = \frac{\pi}{64} (D_o^4 - D_i^4) = \frac{\pi}{64} (159^4 - 157^4)$

3  $I = 1,548,989.747 \text{ in}^4$

4  $C = \frac{159}{2} = 79.5$

5  $\frac{M_c}{I} (\text{SEISMIC}) = \frac{1,506,419.1 \times 79.5}{1,548,989.747} = 77.315 \text{ POUNDS}$   
 6 FOR LINEAR INCH  
 7 OF TANK WALL

8 77.315 "PSI" < 90 PSI. WHICH IS TYPICAL OF  
 9 TIRE PRESSURE FOR ASPHALT  
 10 PAVEMENT, SEE PLANT PAVING  
 11 STANDARDS.

12 PRESSURE (SEISMIC) AT 6" DEPTH (ASPHALT + SUB-BASE)  
 13  $= \frac{77.315}{12} = 6.4429 \text{ PSI}$

14 DEAD LOAD + SEISMIC = 15.67982 PSI

15  $= 2,258 \text{ PSF OK FOR}$   
 16 DYNAMIC  
 17 CONDITION

18 ZPA REQUIRED FOR F.S. AGAINST OVERTURNING

19  $\phi = 1.0$

20  $F_{\text{REQUIRED}} = \frac{14,580,689.6}{61.25} = 238,052.03 \text{ LBS}$

21 OR ZPA =  $\frac{238,052.03 \times 4}{183,404.9 \times 1.25 \times 2.86} = 1.45226$   
 22  $\approx 1.45$

23 REQUIRED COEFFICIENT OF FRICTION (F.S. SLIDING = 1.5)

24  $\mu_o = \frac{24,594.64}{183,404.9} \times 1.5 = 0.20115 \approx 0.20$

25  $0.20 < 0.27 \text{ OK}$   
 26 FROM REFERENCE 6  
 27 & OTHER DATA

EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 9 of 26	
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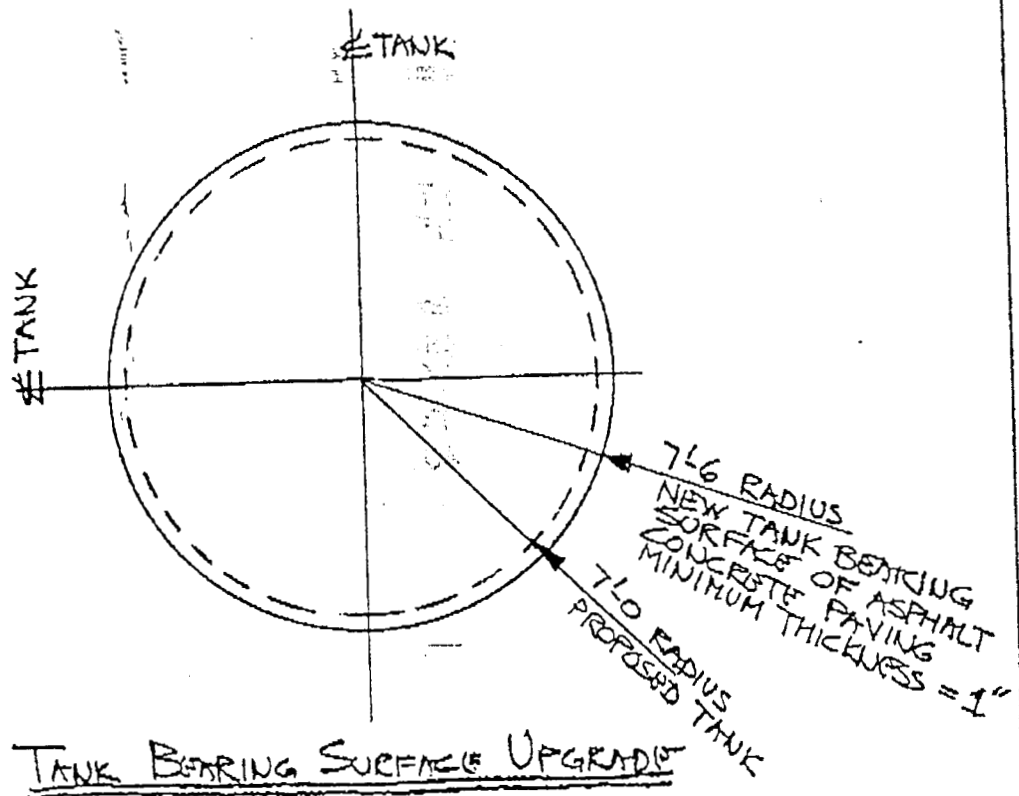
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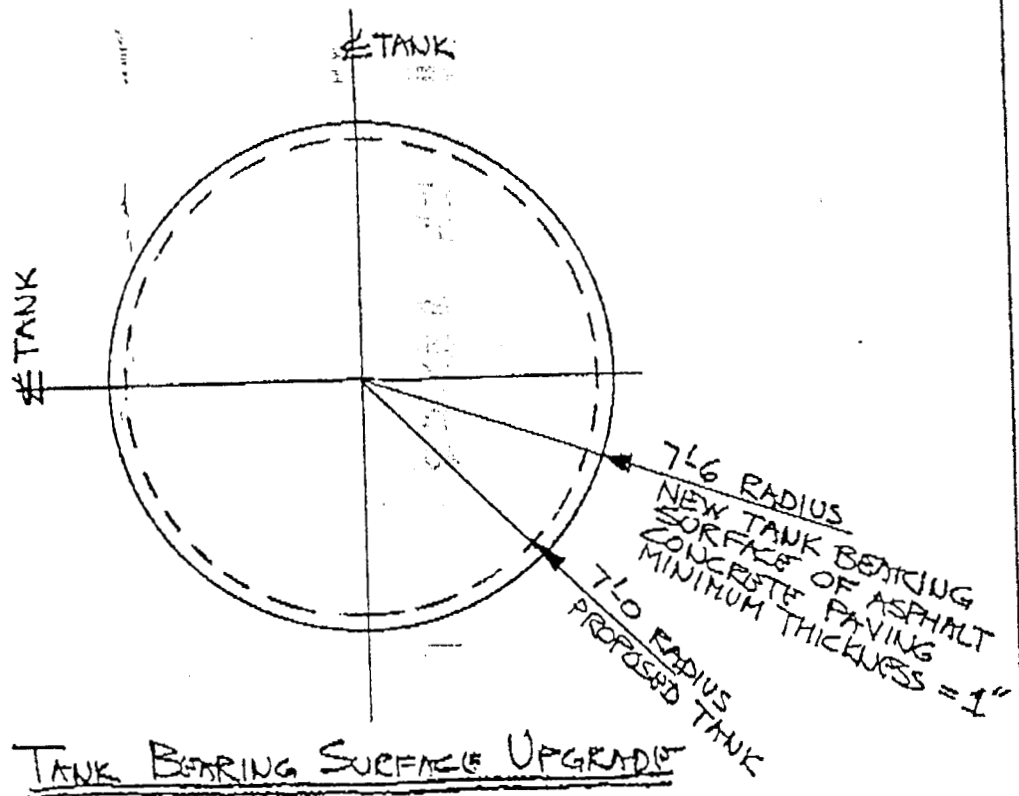
EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 10 of 26	
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PREPARED BY: J.K. GOODALL 11/11/93		CHECKED BY: A. BARTNIK 11/11/93			
SUBJECT: SLUDGE STORAGE TANK FOUNDATION					



NOTE:

1. NUMBER & LOCATION OF TANKS REQUIRING UPGRADE TO BE DETERMINED IN THE FIELD BY STRUCTURAL ENGINEERING.
2. MINIMUM THICKNESS OF ASPHALT BEARING SURFACE IS TO BE 1". SEE "TECHNICAL PROVISIONS, FOR PLANT PAVING IMPROVEMENTS FY93-94 SITE", SECTION 2600 - ASPHALT CONCRETE PAVING FOR SPECIFICATION OF MATERIAL & INSTALLATION REQUIREMENTS.

EG&G ROCKY FLATS		CALCULATION SHEET		CALC PAGE NO. Page 10 of 26	
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CALC-750-NA-000002

DESIGN SUPPORT REQUEST

From: Ron Heitland, X2862, DP0174

To: J. P. Moore

Project Title: Accelerated Sludge Removal Project

Date: October 28, 1993

Project No.: 989181

Please provide a checked calculation to verify the adequacy of the 750 Pad surface to support the sludge storage tanks. The tanks are fabricated of High Density Polyethylene (HDPE) and will be placed directly on the asphalt surface with no physical tiedowns. There are no piping or other connections to the tanks. A minimum space of 2 feet is being required between the tanks to allow for sliding due to seismic forces. The tanks will be placed inside tent 3, tent 4, and tent 6.

Attached are drawings of the primary and secondary containment tanks indicating dimensions and empty tank weights. The primary tank will be placed inside the secondary tank with spacers placed in the annular space between the tanks. The spacers will prevent the tanks from "banging" into each other during a seismic event. The primary tank will only be filled to a maximum height of 122". The specific gravity of the sludge is not expected to exceed 1.9. The system category for the project is Important or Low Hazard.

The tank is not required to be checked at this time. The tank manufacturer will submit calculations for the tank at a later date. A check of these calculations will be performed at that time.

The calculations for the 750 Pad capacity check are needed by 12:00PM on November 5, 1993. If this due date is not acceptable, please let me know as early as possible.

Additionally, please provide the manhours required to complete the calculation and check by C.O.B. October 29, 1993.

Approval has been given to proceed with the calculations immediately. The charge no. for this activity is 989179-05. The project no. is 989181.

Attachments:

Tank Drawings

ATTACHMENT 1  
PAGE 11 OF 26

CALC-750-NA-000002

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ATTACHMENT 1  
PAGE 11 OF 26

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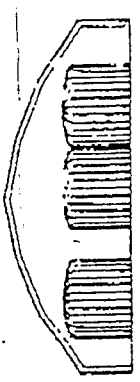
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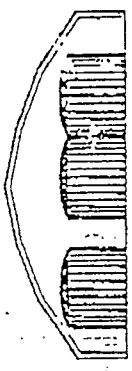
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ATTACHMENT 1 14/26

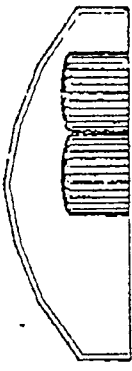
CALC-750-NA-0000012



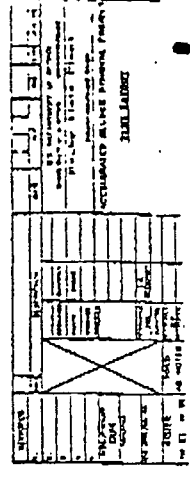
SECTION B-D (TENT 3)  
1"=10'-0"



SECTION C-C (TENT 4)  
1"=10'-0"



SECTION E-E (TENT 6)  
1"=10'-0"



DRAFT

750 PAD SITE LAYOUT

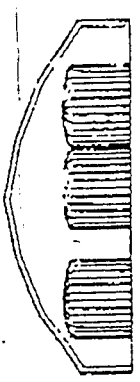
1"=20'-0"

NOTES

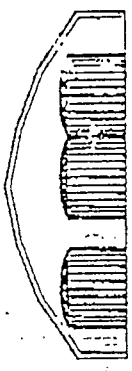
1. TENT 3 WILL ENCLOSE 22 - 14'x12' TANKS.
2. TENT 4 WILL ENCLOSE 25 - 14'x12' TANKS.
3. TENT 6 WILL ENCLOSE 40 - 14'x12' TANKS.
4. RINGER SHINE ON SECTIONS PROVIDES 1'-0" TENT FABRIC CLEARANCE.
5. 87 TANKS TOTAL - 4 SPARE
6. 14'x12' HIGH TANKS HAVE A TOTAL CAPACITY OF 10,800 GALS. PER TANK
7. TANK SPACING  
A. MAINTAIN 3'-0" CLEARANCE BETWEEN TANKS  
B. MAINTAIN 8'-0" CLEARANCE BETWEEN TANKS  
C. MAINTAIN 5'-0" AISLE CLEARANCE BETWEEN TANKS  
D. SPARE TANK

ATTACHMENT 1 14/26

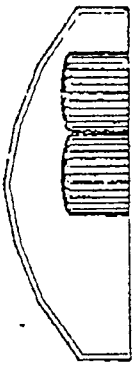
CALC-750-NA-0000012



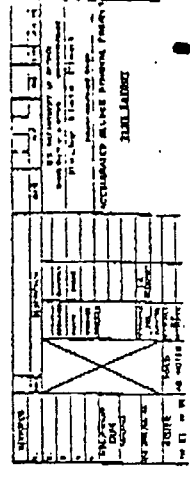
SECTION B-D (TENT 3)  
1"=10'-0"



SECTION C-C (TENT 4)  
1"=10'-0"



SECTION E-E (TENT 6)  
1"=10'-0"



DRAFT

750 PAD SITE LAYOUT

1"=20'-0"

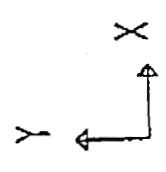
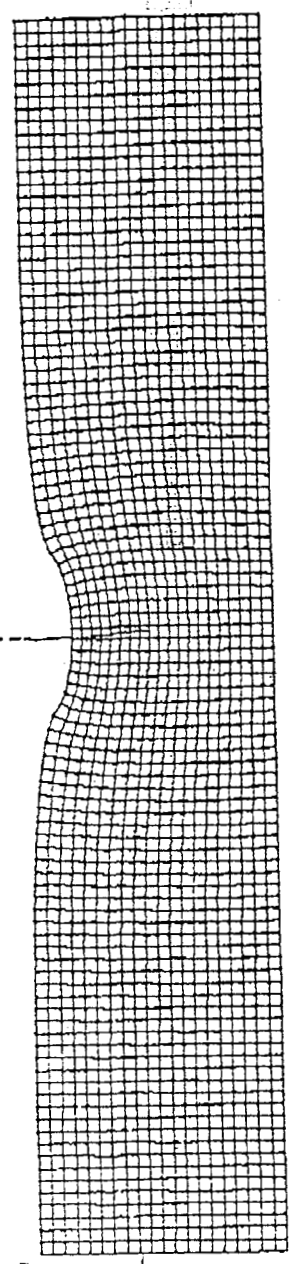
NOTES

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  - A. MAINTAIN 3'-0" CLEARANCE BETWEEN TANKS
  - B. MAINTAIN 8'-0" CLEARANCE BETWEEN TANKS
  - C. MAINTAIN 5'-0" AISLE CLEARANCE BETWEEN TANKS
8. SPARE TANK

DEAD LOAD - 1 TANK



1



TANKS750

DEFORMED  
SHAPE

LOAD

1

UNITS = INCHES

MINIMA

X -0.2386E+00

Y -0.9342E+00

Z 0.0000E+00

MAXIMA

X 0.2385E+00

Y 0.1006E-01

Z 0.0000E+00

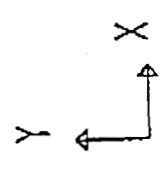
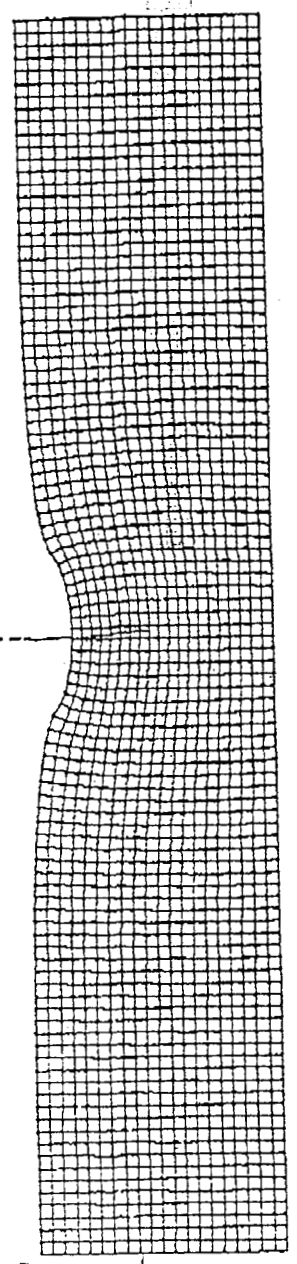
SAP90

CALC-750-NA-0000002

DEAD LOAD - 1 TANK



1



TANKS750

DEFORMED  
SHAPE

LOAD

1

UNITS = INCHES

MINIMA

X -0.2386E+00

Y -0.9342E+00

Z 0.0000E+00

MAXIMA

X 0.2385E+00

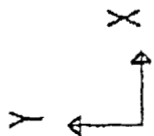
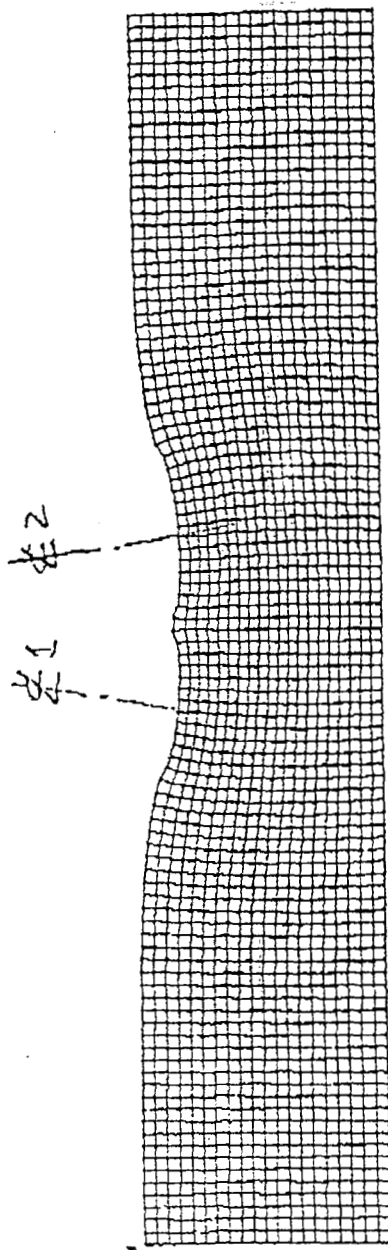
Y 0.1006E-01

Z 0.0000E+00

SAP90

CALC-750-NA-0000002

DOWD LOAD - 2 TANKS



TANKS750

DEFORMED  
SHAPE

LOAD 2

UNITS=INCHES

MINIMA

X-0.2949E+00

Y-0.1061E+01

Z 0.0000E+00

MAXIMA

X 0.2901E+00

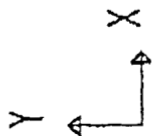
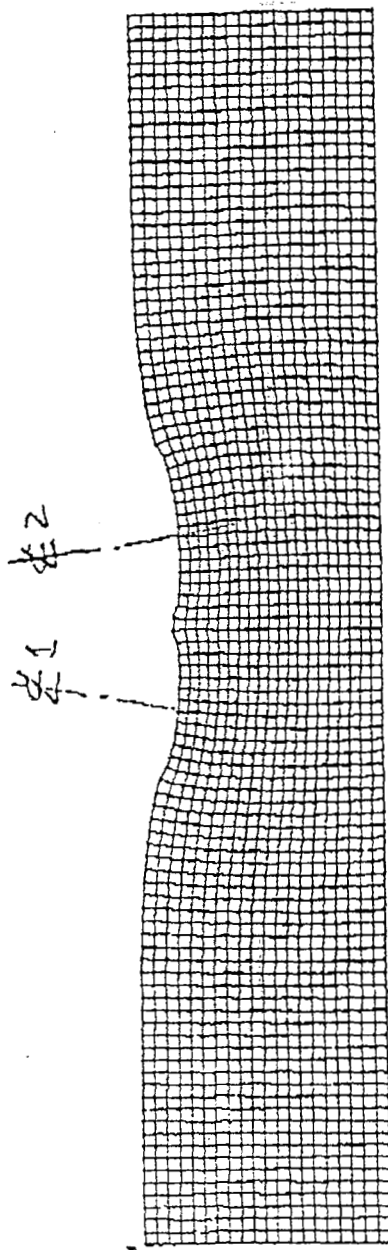
Y-0.2515E-01

Z 0.0000E+00

SAP90

CALC-750-NA-0000002

DOWD LOAD - 2 TANKS



TANKS750

DEFORMED  
SHAPE

LOAD 2

UNITS=INCHES

MINIMA

X-0.2949E+00

Y-0.1061E+01

Z 0.0000E+00

MAXIMA

X 0.2901E+00

Y-0.2515E-01

Z 0.0000E+00

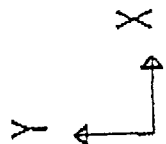
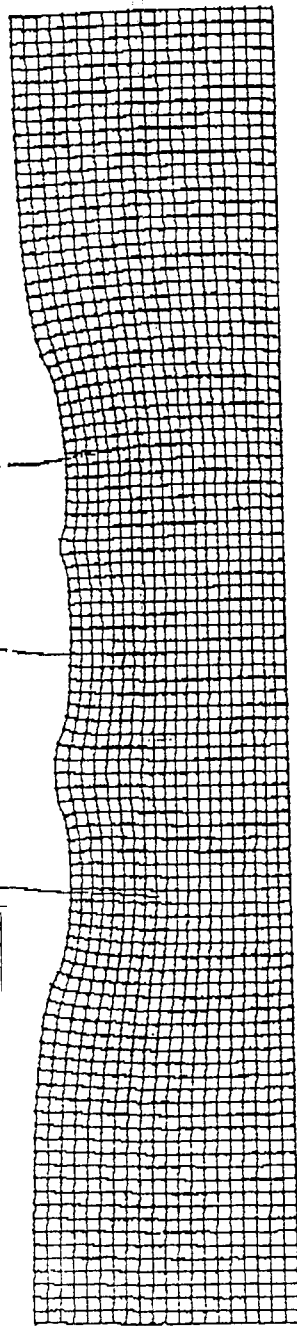
SAP90

CALC-750-NA-0000002

DEAD LOAD - 3 TANKS

1" = 10'

1 2 3



TANKS750

DEFORMED  
SHAPE

LOAD

3

UNITS = INCHES

MINIMA

X -0.3147E+00

Y -0.1101E+01

Z 0.0000E+00

MAXIMA

X 0.2985E+00

Y 0.5207E-01

Z 0.0000E+00

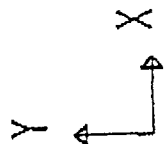
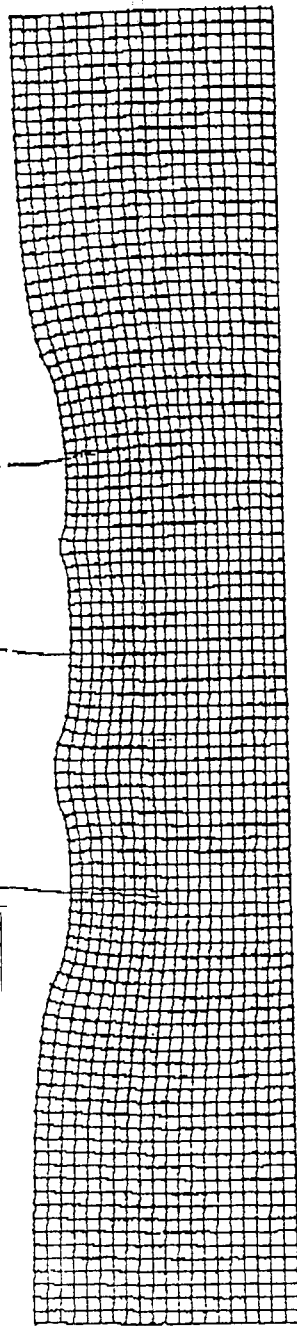
SAP90

CALC-750-N/A-000002

DEAD LOAD - 3 TANKS

1" = 10'

1 2 3



TANKS750

DEFORMED  
SHAPE

LOAD

3

UNITS = INCHES

MINIMA

X -0.3147E+00

Y -0.1101E+01

Z 0.0000E+00

MAXIMA

X 0.2985E+00

Y 0.5207E-01

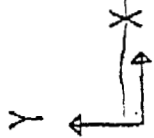
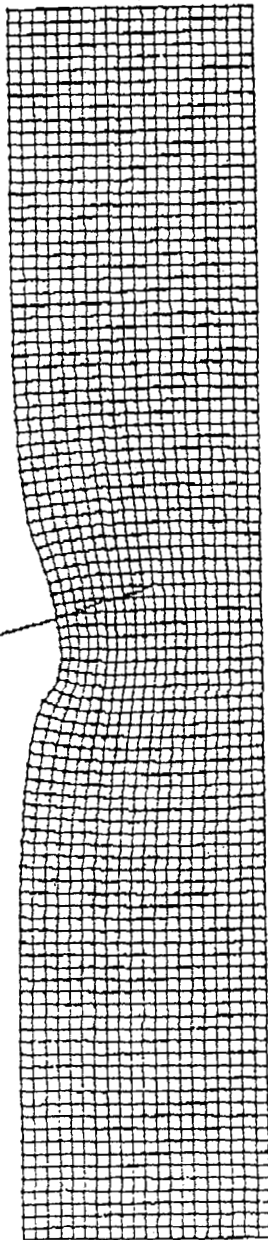
Z 0.0000E+00

SAP90

CALC-750-N/A-000000

DEAD + SEISMIC - 1 TANK

#1



TANKS750

DEFORMED  
SHAPE

LOAD 4

UNITS = INCHES

MINIMA

X -0.2207E+00

Y -0.9961E+00

Z 0.0000E+00

MAXIMA

X 0.2585E+00

Y 0.1015E-01

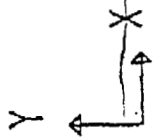
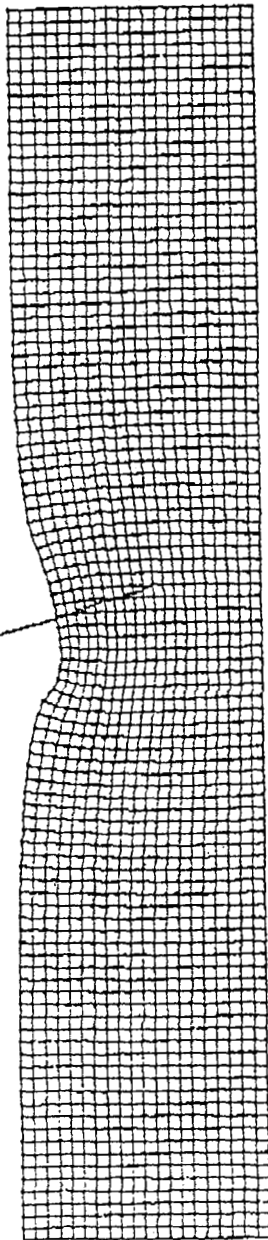
Z 0.0000E+00

SAP90

CALC-750-NA-000002

DEAD + SEISMIC - 1 TANK

#1



TANKS750

DEFORMED  
SHAPE

LOAD 4

UNITS = INCHES

MINIMA

X -0.2207E+00

Y -0.9961E+00

Z 0.0000E+00

MAXIMA

X 0.2585E+00

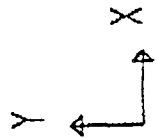
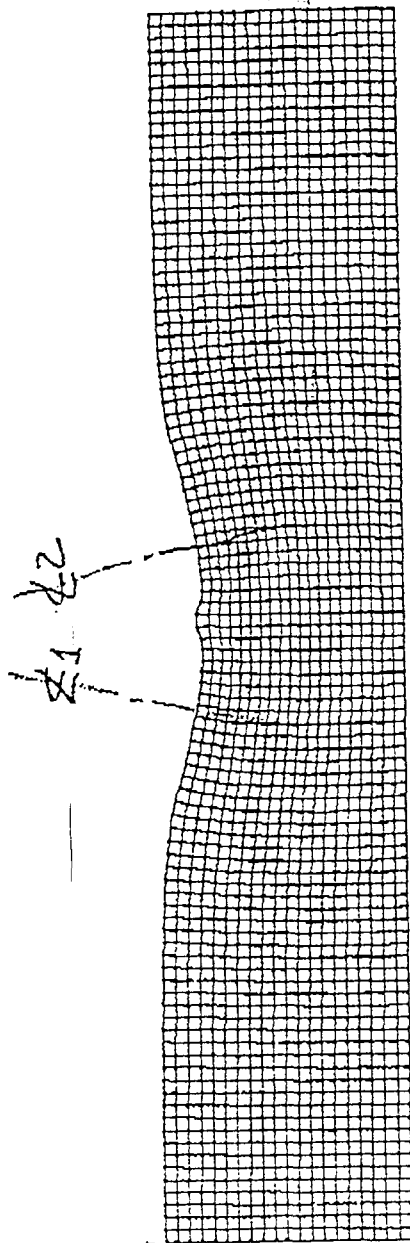
Y 0.1015E-01

Z 0.0000E+00

SAP90

CALC-750-NA-000002

DEAD + SEISMIC - Z TANKS



TANKS750

DEFORMED  
SHAPE

LOAD

5

UNITS = INCHES

MINIMA

X -0.2945E+00

Y -0.1252E+01

Z 0.0000E+00

MAXIMA

X 0.2940E+00

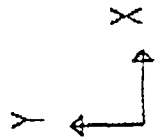
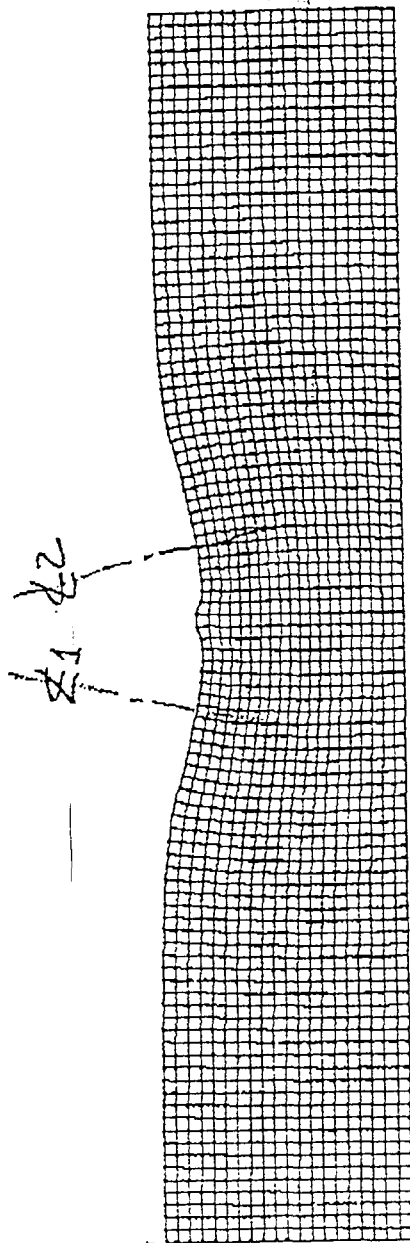
Y 0.2395E-01

Z 0.0000E+00

SAP90

CALC-750-KA-000000

DEAD + SEISMIC - Z TANKS



TANKS750

DEFORMED  
SHAPE

LOAD

5

UNITS = INCHES

MINIMA

X -0.2945E+00

Y -0.1252E+01

Z 0.0000E+00

MAXIMA

X 0.2940E+00

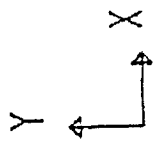
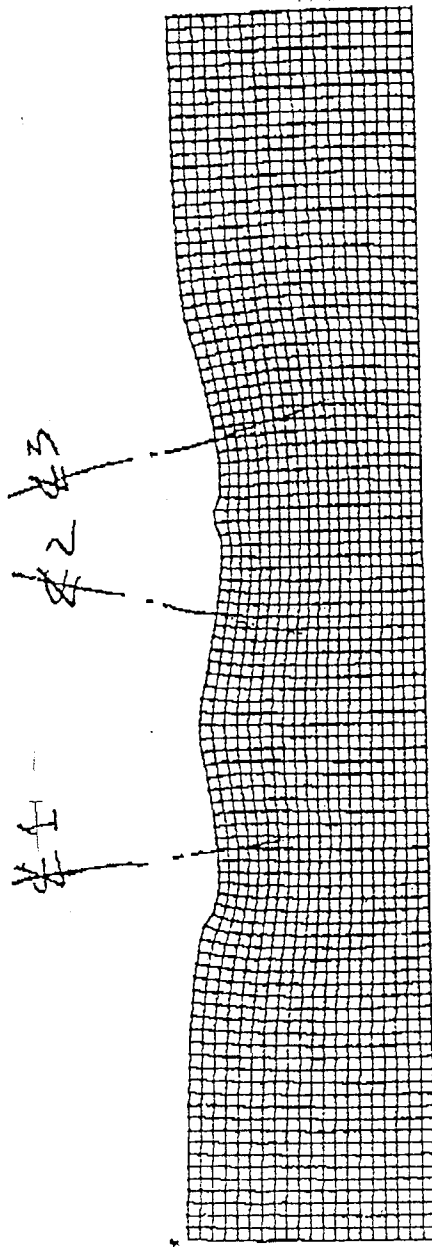
Y 0.2395E-01

Z 0.0000E+00

SAP90

CALC-750-KA-000000

DEAD + SEISMIC - 3 TANKS



TANKS750

DEFORMED  
SHAPE

LOAD

6

UNITS = INCHES

MINIMA

X -0.3096E+00

Y -0.1262E+01

Z 0.0000E+00

MAXIMA

X 0.3142E+00

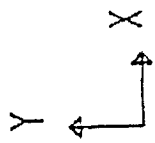
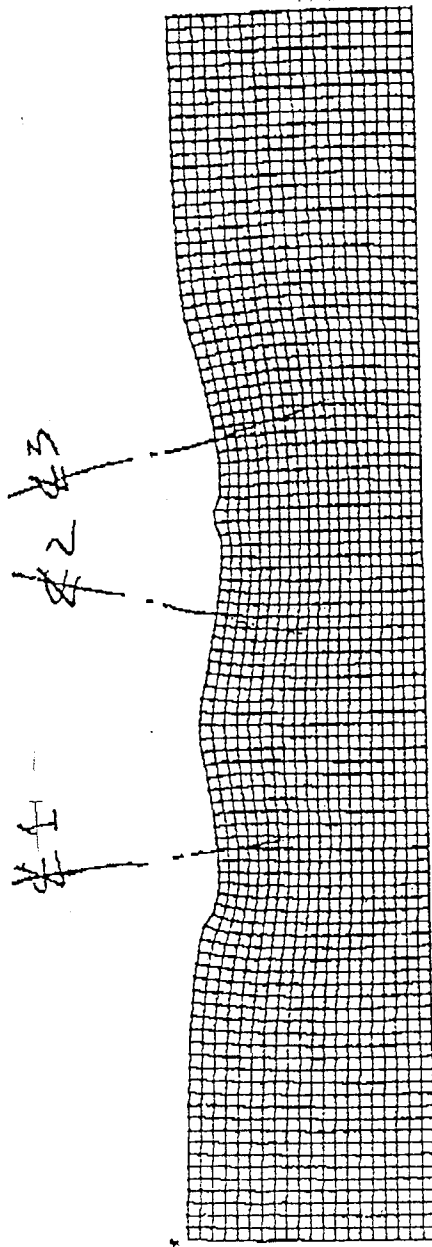
Y 0.5110E-01

Z 0.0000E+00

SAP90

CALC-750-NA-000002

DEAD + SEISMIC - 3 TANKS



TANKS750

DEFORMED  
SHAPE

LOAD

6

UNITS = INCHES

MINIMA

X -0.3096E+00

Y -0.1262E+01

Z 0.0000E+00

MAXIMA

X 0.3142E+00

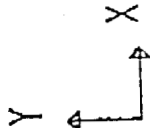
Y 0.5110E-01

Z 0.0000E+00

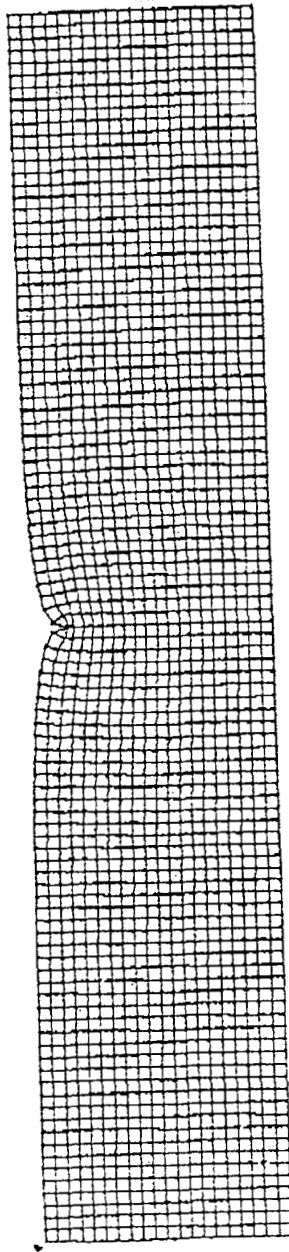
SAP90

CALC-750-NA-000002

CALC-750-NA-000002

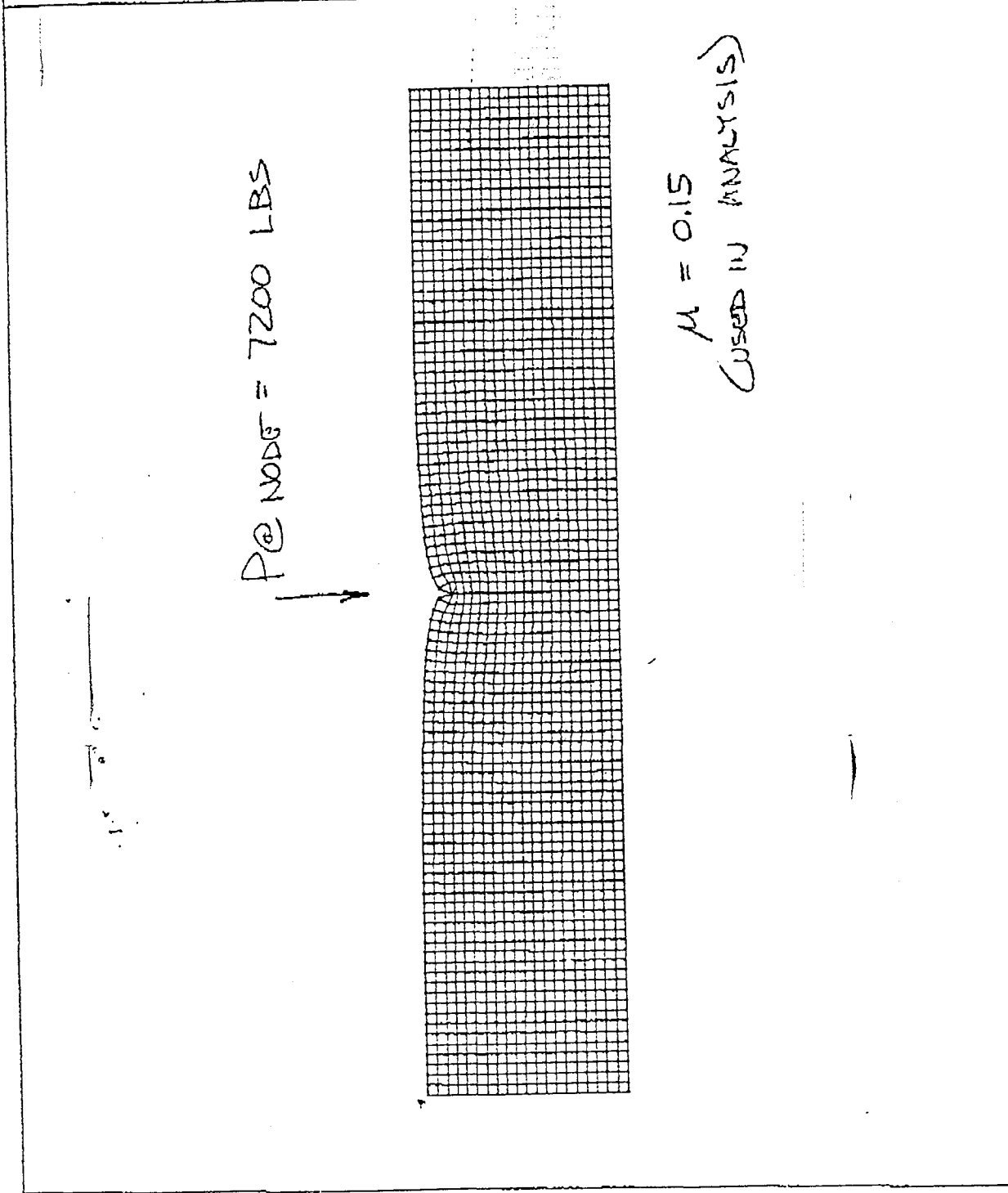
	<p>TEST II</p> <p>DEFORMED</p> <p>SHAPE</p> <p>LOAD 1</p>	<p>UNITS = INCHES</p> <p>MINIMA</p> <p>X -0.1679E+00</p> <p>Y -0.9959E+00</p> <p>Z 0.0000E+00</p> <p>MAXIMA</p> <p>X 0.1679E+00</p> <p>Y 0.6983E-02</p> <p>Z 0.0000E+00</p>
<p>SAP90</p>		

POWDER = 7200 LBS



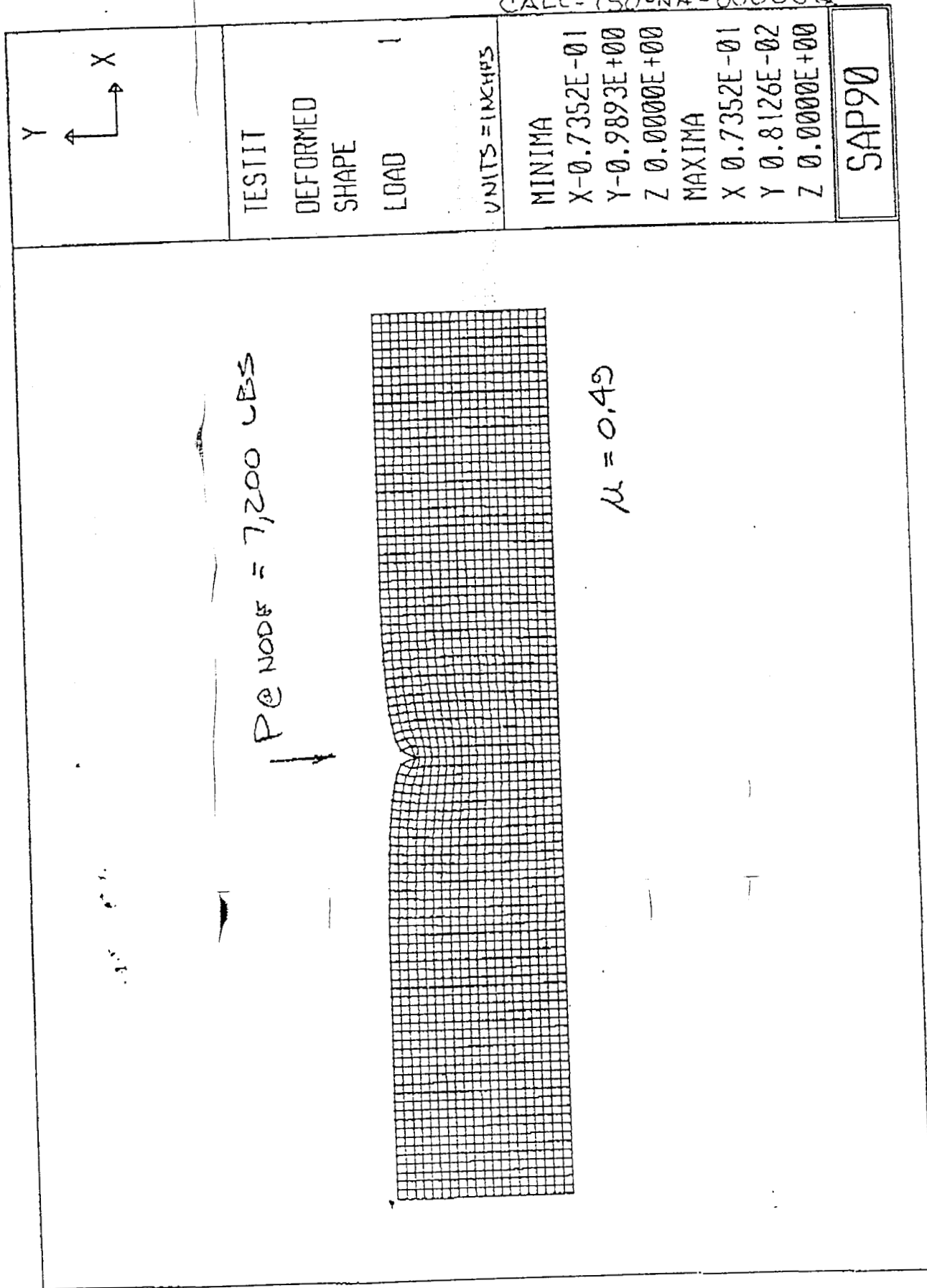
$\mu = 0.01$

<div>Y ↑ X →</div>	
TEST II	
DEFORMED SHAPE	
LOAD	I
UNITS = INCHES	
MINIMA	
X	-0.1384E+00
Y	-0.1000E+01
Z	0.0000E+00
MAXIMA	
X	0.1384E+00
Y	0.3419E-02
Z	0.0000E+00
SAP90	



CALC-750-NA-000000

CALC-750-NA-000002



# SAP50 INPUT - ATTACHMENT 2 24/26

CALC-750-NA-000002

## SURFACE DISPLACEMENTS DUE TO TANK LOADING

### SYSTEM

L=7 N=2500

### JOINTS

1 X=0000.0 Y=000.0 Z=0.0

101 X=1200.0 Y=000.0 Z=0.0

2021 X=0000.0 Y=240.0 Z=0.0

2121 X=1200.0 Y=240.0 Z=0.0 Q=1,101,2021,2121,1,101

### RESTRAINTS

1 101 1 R=1,1,1,0,0,0

102 2121 1 R=0,0,1,0,0,0

### SHELL

NM=1

1 E=1783.0 U=0.15 W=0.000000

1 JQ=1,2,102,103 ETYPE=0 M=1 TH=12.0,12.0 LP=-1 G=100,20

### LOADS

(ALL JOINT LOADS)

2065 2078 1 L=1 F=0.0,-1344.2,0.0,0.0,0.0,0.0

2059 2070 1 L=2 F=0.0,-1344.2,0.0,0.0,0.0,0.0

2073 2086 1 L=2 F=0.0,-1344.2,0.0,0.0,0.0,0.0

2047 2060 1 L=3 F=0.0,-1344.2,0.0,0.0,0.0,0.0

2066 2079 1 L=3 F=0.0,-1344.2,0.0,0.0,0.0,0.0

2082 2095 1 L=3 F=0.0,-1344.2,0.0,0.0,0.0,0.0

2065 2065 1 L=4 F=0.0,-1975.3,0.0,0.0,0.0,0.0

2066 2066 1 L=4 F=0.0,-1878.2,0.0,0.0,0.0,0.0

2067 2067 1 L=4 F=0.0,-1781.1,0.0,0.0,0.0,0.0

2068 2068 1 L=4 F=0.0,-1684.0,0.0,0.0,0.0,0.0

2069 2069 1 L=4 F=0.0,-1586.9,0.0,0.0,0.0,0.0

2070 2070 1 L=4 F=0.0,-1489.8,0.0,0.0,0.0,0.0

2071 2071 1 L=4 F=0.0,-1392.7,0.0,0.0,0.0,0.0

2072 2072 1 L=4 F=0.0,-1295.7,0.0,0.0,0.0,0.0

2073 2073 1 L=4 F=0.0,-1198.6,0.0,0.0,0.0,0.0

2074 2074 1 L=4 F=0.0,-1101.5,0.0,0.0,0.0,0.0

2075 2075 1 L=4 F=0.0,-1004.4,0.0,0.0,0.0,0.0

2076 2076 1 L=4 F=0.0,-907.3,0.0,0.0,0.0,0.0

2077 2077 1 L=4 F=0.0,-810.2,0.0,0.0,0.0,0.0

2078 2078 1 L=4 F=0.0,-713.1,0.0,0.0,0.0,0.0

2057 2057 1 L=5 F=0.0,-0713.1,0.0,0.0,0.0,0.0

2058 2058 1 L=5 F=0.0,-0810.2,0.0,0.0,0.0,0.0

2059 2059 1 L=5 F=0.0,-0907.3,0.0,0.0,0.0,0.0

2060 2060 1 L=5 F=0.0,-1004.4,0.0,0.0,0.0,0.0

2061 2061 1 L=5 F=0.0,-1101.5,0.0,0.0,0.0,0.0

2062 2062 1 L=5 F=0.0,-1198.6,0.0,0.0,0.0,0.0

2063 2063 1 L=5 F=0.0,-1295.7,0.0,0.0,0.0,0.0

2064 2064 1 L=5 F=0.0,-1392.7,0.0,0.0,0.0,0.0

2065 2065 1 L=5 F=0.0,-1489.8,0.0,0.0,0.0,0.0

2066 2066 1 L=5 F=0.0,-1586.9,0.0,0.0,0.0,0.0

2067 2067 1 L=5 F=0.0,-1684.0,0.0,0.0,0.0,0.0

2068 2068 1 L=5 F=0.0,-1781.1,0.0,0.0,0.0,0.0

2069 2069 1 L=5 F=0.0,-1878.2,0.0,0.0,0.0,0.0

2070 2070 1 L=5 F=0.0,-1975.3,0.0,0.0,0.0,0.0

2073 2073 1 L=5 F=0.0,-1975.3,0.0,0.0,0.0,0.0

ACTUAL TANK GEOMETRY  
VOLUME & OVERTURNING  
MOMENT IS DIFFERENT  
THAN WHAT IS MODELLED  
& IS LESS CONSERVATIVE  
THAN THE MODEL.

DL 1 TANK  
DL 2 TANK  
DL 3 TANKS  
DL + SEISMIC  
1 TANK

NODAL FORCE

$$= \pm 144 \times \frac{Mc}{I} + \frac{P}{A_{DL}}$$

I, c & A ARE BASED ON  
14'-0" Ø TANK

DL + SEISMIC  
2 TANKS

$$P \approx 207,000 \text{ #/s}$$

$$M \approx 2.2 \times 10^6 \text{ IN-LB}$$

# SAP30 INPUT ATTACHMENT 2 25/26

CALC-750-NA-000002

2074 2074 1 L=5 F=0.0,-1878.2,0.0,0.0,0.0,0.0  
 2075 2075 1 L=5 F=0.0,-1781.1,0.0,0.0,0.0,0.0  
 2076 2076 1 L=5 F=0.0,-1684.0,0.0,0.0,0.0,0.0  
 2077 2077 1 L=5 F=0.0,-1586.9,0.0,0.0,0.0,0.0  
 2078 2078 1 L=5 F=0.0,-1489.8,0.0,0.0,0.0,0.0  
 2079 2079 1 L=5 F=0.0,-1392.7,0.0,0.0,0.0,0.0  
 2080 2080 1 L=5 F=0.0,-1295.7,0.0,0.0,0.0,0.0  
 2081 2081 1 L=5 F=0.0,-1198.6,0.0,0.0,0.0,0.0  
 2082 2082 1 L=5 F=0.0,-1101.5,0.0,0.0,0.0,0.0  
 2083 2083 1 L=5 F=0.0,-1004.4,0.0,0.0,0.0,0.0  
 2084 2084 1 L=5 F=0.0,-0907.3,0.0,0.0,0.0,0.0  
 2085 2085 1 L=5 F=0.0,-0810.2,0.0,0.0,0.0,0.0  
 2086 2086 1 L=5 F=0.0,-0713.1,0.0,0.0,0.0,0.0  
 2047 2047 1 L=6 F=0.0,-1975.3,0.0,0.0,0.0,0.0  
 2048 2048 1 L=6 F=0.0,-1878.2,0.0,0.0,0.0,0.0  
 2049 2049 1 L=6 F=0.0,-1781.1,0.0,0.0,0.0,0.0  
 2050 2050 1 L=6 F=0.0,-1684.0,0.0,0.0,0.0,0.0  
 2051 2051 1 L=6 F=0.0,-1586.9,0.0,0.0,0.0,0.0  
 2052 2052 1 L=6 F=0.0,-1489.8,0.0,0.0,0.0,0.0  
 2053 2053 1 L=6 F=0.0,-1392.7,0.0,0.0,0.0,0.0  
 2054 2054 1 L=6 F=0.0,-1295.7,0.0,0.0,0.0,0.0  
 2055 2055 1 L=6 F=0.0,-1198.6,0.0,0.0,0.0,0.0  
 2056 2056 1 L=6 F=0.0,-1101.5,0.0,0.0,0.0,0.0  
 2057 2057 1 L=6 F=0.0,-1004.4,0.0,0.0,0.0,0.0  
 2058 2058 1 L=6 F=0.0,-0907.3,0.0,0.0,0.0,0.0  
 2059 2059 1 L=6 F=0.0,-0810.2,0.0,0.0,0.0,0.0  
 2060 2060 1 L=6 F=0.0,-0713.1,0.0,0.0,0.0,0.0  
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 2067 2067 1 L=6 F=0.0,-0810.2,0.0,0.0,0.0,0.0  
 2068 2068 1 L=6 F=0.0,-0907.3,0.0,0.0,0.0,0.0  
 2069 2069 1 L=6 F=0.0,-1004.4,0.0,0.0,0.0,0.0  
 2070 2070 1 L=6 F=0.0,-1101.5,0.0,0.0,0.0,0.0  
 2071 2071 1 L=6 F=0.0,-1198.6,0.0,0.0,0.0,0.0  
 2072 2072 1 L=6 F=0.0,-1295.7,0.0,0.0,0.0,0.0  
 2073 2073 1 L=6 F=0.0,-1392.7,0.0,0.0,0.0,0.0  
 2074 2074 1 L=6 F=0.0,-1489.8,0.0,0.0,0.0,0.0  
 2075 2075 1 L=6 F=0.0,-1586.9,0.0,0.0,0.0,0.0  
 2076 2076 1 L=6 F=0.0,-1684.0,0.0,0.0,0.0,0.0  
 2077 2077 1 L=6 F=0.0,-1781.1,0.0,0.0,0.0,0.0  
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 2083 2083 1 L=6 F=0.0,-1878.2,0.0,0.0,0.0,0.0  
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 2085 2085 1 L=6 F=0.0,-1684.0,0.0,0.0,0.0,0.0  
 2086 2086 1 L=6 F=0.0,-1586.9,0.0,0.0,0.0,0.0  
 2087 2087 1 L=6 F=0.0,-1489.8,0.0,0.0,0.0,0.0  
 2088 2088 1 L=6 F=0.0,-1392.7,0.0,0.0,0.0,0.0  
 2089 2089 1 L=6 F=0.0,-1295.7,0.0,0.0,0.0,0.0  
 2090 2090 1 L=6 F=0.0,-1198.6,0.0,0.0,0.0,0.0  
 2091 2091 1 L=6 F=0.0,-1101.5,0.0,0.0,0.0,0.0  
 2092 2092 1 L=6 F=0.0,-1004.4,0.0,0.0,0.0,0.0  
 2093 2093 1 L=6 F=0.0,-0907.3,0.0,0.0,0.0,0.0  
 2094 2094 1 L=6 F=0.0,-0810.2,0.0,0.0,0.0,0.0

DL + SEISMIC  
 3 TIMES

# SAP30 INPUT ATTACHMENT 2

26/26

CALC-750-NA-000002

2095 2095 1 L=6 F=0.0,-0713.1,0.0,0.0,0.0,0.0  
2071 2071 1 L=7 F=0.0,-7200.0,0.0,0.0,0.0,0.0

SELECT

NT=1 ID=1,2121,1 SW=1

SINGLE CONCENTRATED  
LOAD USED TO  
CALIBRATE MODEL

## Enclosure D

### Draft Report of Hydrostatic Testing and Acceptance Inspection

The following describes the hydrostatic testing and acceptance inspection of the tanks that will be used for storing the sludge from the 207B Ponds, 207C Ponds, and the 788 clarifier.

1. All additional tanks, including the primary and secondary, shall be tested at the supplier's facility by filling the tanks with water as required by ASTM D1998. The tanks shall be checked for leaks for a period of 30 minutes. The results of the test shall be documented on each tank "Shop Traveler" that will be delivered with the tank.

Clarification was requested from ASTM on the requirements of the hydrostatic test as indicated in ASTM D1998, Section 11.6. Mr. Lew Joesten, a technical contact for this ASTM, stated that the intent of the hydrostatic test requirement was to fill the tank with water with no additional pressurization. This procedure was also valid for a tank designed to a specific gravity greater than 1.0.

2. The supplier shall provide the results of the low temperature impact test and the gel test as required by ASTM D1998. The results will be indicated on each tank "Shop Traveler." These tests are indications of the quality of the tank material and the molding process.

The supplier shall also provide the measured tank wall thicknesses at locations as requested by EG&G Rocky Flats. The wall thicknesses shall be indicated on each tank "Shop Traveler" for comparison to the design wall thicknesses and ASTM tolerances. This testing is not required by CCR or ASTM D1998.

3. The outer tank shall be inspected for damage by EG&G's Procurement Quality Support (PQS) Department upon delivery at the Rocky Flats Plant. PQS shall also verify receipt of all supplier testing documentation.
4. After installation, the primary tank shall be checked for leaks as required by ASTM D1998. The tank shall be filled with water to the ten foot height level. The tank shall be checked for leaks for a period of 30 minutes.
5. The tanks shall be inspected by the Independent Tank Certifier (ITC) after installation. The criteria for the inspection shall be determined by ITC.
6. Operation procedures shall require the primary tank to be checked for leaks immediately after filing. After this initial check, the tank shall be inspected for leaks on a schedule to be established by operations personnel to meet regulatory requirements.

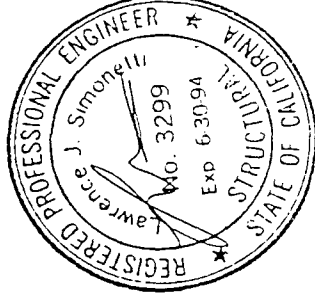
Enclosure E

Fabrication and Installation Package:

- Tanks
- Vents
- Leak Detection

# STRUCTURAL CALCULATION FOR POLY CAL PLASTICS BARLOW FORMULA

MHL 11/1/93



EG & G Job

## BARLOW FORMULA

$$\text{WALL THICKNESS} = \frac{P \times O.D.}{2SD} = (0.433 \times S.G. \times H \times O.D.) / 2SD$$

SD = HYDROSTATIC DESIGN STRESS psi

P = PRESSURE (433\*S.G.\*H), psi

H = FLUID HEAD, ft

S.G. = SPECIFIC GRAVITY OF FLUID

O.D. = OUTSIDE DIAMETER, in

		ASTM	
	STRAIGHT SIDE WALL	CALCULATED	
		HEIGHT	WALL THICKNESS
SD 600 SG 1.9 OD 162		1	0.19
		2	0.22
		3	0.33
		4	0.44
		5	0.56
PRODUCT 13.5'		6	0.67
		7	0.78
		8	0.89
		9	1.00
		10	1.11
DOME THICKNESS			0.19
FLOOR THICKNESS			0.19

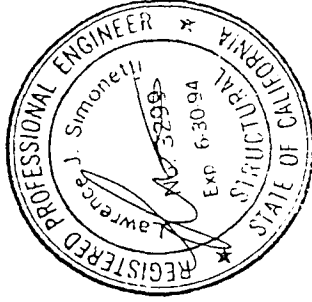
	ASTM CALCULATION	POLY CAL'S		THICKNESS TOLERANCE -20% OF DESIGN
		DESIGNED WALL THICKNESS		
	0.433*1.9*2*162/(2*600)	0.50		0.40
	0.433*1.9*3*162/(2*600)	0.50		0.40
	0.433*1.9*4*162/(2*600)	0.50		0.40
	0.433*1.9*5*162/(2*600)	0.56		0.45
	0.433*1.9*6*162/(2*600)	0.68		0.54
	0.433*1.9*7*162/(2*600)	0.78		0.62
	0.433*1.9*8*162/(2*600)	0.89		0.71
	0.433*1.9*9*162/(2*600)	1.00		0.80
	0.433*1.9*10*162/(2*600)	1.11		0.89
		0.68		0.54

POLY CAL'S DESIGNED FLOOR THICKNESS	POLY CAL'S MINIMUM FLOOR THICKNESS
0.50	0.38

FLOOR THICKNESS OR TOLERANCE IS NOT CALLED OUT IN ASTM.  
WALL AND DOME TOLERANCES ON THE LOW SIDE WILL COMPLY WITH ASTM 9.1.3  
WALL THICKNESS CALCULATION ARE TO THE STRAIGHT SIDEWALL HEIGHT ONLY.

# STRUCTURAL CALCULATION FOR POLY CAL PLASTICS BARLOW FORMULA

MHL 11/1/93



EG & G Job

## BARLOW FORMULA

$$\text{WALL THICKNESS} = P \times \text{O.D.} / 2SD = (0.433 \times \text{S.G.} \times H \times \text{O.D.}) / 2SD$$

SD = HYDROSTATIC DESIGN STRESS, psi

P = PRESSURE (.433 \* S.G. \* H), psi

H = FLUID HEAD, ft

S.G. = SPECIFIC GRAVITY OF FLUID

O.D. = OUTSIDE DIAMETER, in

	STRAIGHT SIDE WALL HEIGHT	ASTM		ASTM CALCULATION	POLY CAL'S DESIGNED WALL THICKNESS	THICKNESS TOLERANCE -20% OF DESIGN
		ASTM CALCULATED WALL THICKNESS	ASTM WALL THICKNESS			
SD 600 SG 1.9 OD 168	1	0.19	0.19	0.433*1.9*2*168/(2*600)	0.50	0.40
	2	0.23	0.23	0.433*1.9*3*168/(2*600)	0.50	0.40
	3	0.35	0.35	0.433*1.9*4*168/(2*600)	0.50	0.40
	4	0.46	0.46	0.433*1.9*5*168/(2*600)	0.58	0.46
	5	0.58	0.58	0.433*1.9*6*168/(2*600)	0.69	0.55
PRODUCT 14' CONTAINMENT	6	0.69	0.69	0.433*1.9*7*168/(2*600)	0.81	0.64
	7	0.81	0.81	0.433*1.9*8*168/(2*600)	0.92	0.74
	8	0.92	0.92	0.433*1.9*9*168/(2*600)	1.04	0.83
	9	1.04	1.04	0.433*1.9*10*168/(2*600)	1.15	0.92
	10	1.15	1.15	0.433*1.9*11*168/(2*600)	1.27	1.01
	11	1.27	1.27			

FLOOR THICKNESS 0.19

POLY CAL'S  
DESIGNED  
FLOOR THICKNESS 0.50

POLY CAL'S  
MINIMUM  
FLOOR THICKNESS 0.38

FLOOR THICKNESS OR TOLERANCE IS NOT CALLED OUT IN ASTM.

WALL TOLERANCES ON THE LOW SIDE WILL COMPLY WITH ASTM 9.1.3

WALL THICKNESS CALCULATION ARE TO THE STRAIGHT SIDEWALL HEIGHT ONLY.

Page containing possible Proprietary information removed.

Page containing possible Proprietary information removed.

## DESIGN MODIFICATION PACKAGE

TITLE: ACCELERATED SLUDGE REMOVAL PROJECT (P.N. 989181)  
TANK LAYOUT PACKAGE

DATE OF RELEASE: NOVEMBER 18, 1993

CONCURRENCE: Thomas d. Beckman 18 Nov 93  
Thomas d. Beckman, Project Manager

PREPARED BY: Ronald B. Heitland  
Ronald B. Heitland, Project Engineer

APPROVED BY: John G. Lehew  
John G. Lehew, Project Engineering Manager

### DISTRIBUTION

Thomas Beckman - Project Manager, Bldg 080  
Joe Mellon - Program Manager, Bldg 080  
Joe Roberts - Operations Manager, T893B  
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Dave Chojnacki - Health & Safety, T690C  
Doug Perryman - Health & Safety, T452C  
David Warfield - Facilities Quality Engineering, T130A  
Doug Hughes - Instrumentation & Controls, T130J  
Greg Pickerel - Environmental Design Engineering, Bldg 030  
Linda Ehrlich - Architectural Engineering, Bldg 130  
Darrol Crabb - Construction Management, T130F  
S. Seyedian - J. A. Jones Construction, T690A  
Ken Brusegaard - Cost Estimating, T130D  
Tom Bourgeois - Construction Management, T764B  
P. Ciullo - DOE/CED, Bldg 116

DESIGN MODIFICATION PACKAGE (DMP) CONTENTS

	<u>DOCUMENT</u>	<u>INCLUDED IN DMP</u>	<u>REF. LOCATION</u>
1.	OBJECTIVE AND TECHNICAL SCOPE		PROJECT FILE
2.	ENGINEERING WORK PLAN		PROJECT FILE
3.	GENERAL ENGINEERING SERVICES SCREEN	X	
4.	AGM APPROVAL LETTER (APPROVAL FOR USE OF COEM PROC. 6.02)	X	
5.	SYSTEMS CLASSIFICATION FORM	X	
6.	ITEM FUNCTIONAL CLASSIFICATION FORM	X	
7.	CALCULATIONS CALC. NO.: CALC-750-NA-000002 SLUDGE STORAGE TANK FOUNDATION		ENGINEERING DOC. CONTROL
8.	TANK BEARING SURFACE UPGRADE REQUIREMENTS	X	
9.	QUALITY VERIFICATION PLAN	X	
10.	DRAWINGS		
	DWG. NO. 51006-200	X	
	DWG. NO. 51006-201	X	
	DWG. NO. 51006-202	X	
	DWG. NO. 51006-203	X	

APPENDIX I

Page 1 of 1

PROGRAM ASSIGNMENT SCREEN

SECTION A - NUCLEAR WORK PROCESS REQUIRED

Y

N

1. Does work affect/modify Vital Safety Systems

\_\_\_\_\_

X

a. Modify VSS hardware, software or require a change in VSS

\_\_\_\_\_

X

b. Impact a vital safety function during installation, modification, or repair?

\_\_\_\_\_

X

c. Will this work create an "Out-of-Tolerance" or "Violation" with respect to any Criticality Safety Operating Limit (CSOL) or Nuclear Material Safety Limit (NMSL), or is new CSOL or NMSL required?

\_\_\_\_\_

X

d. Will this work require any modification, addition or deletion of an existing VSS procedure?

\_\_\_\_\_

X

e. Will this work impact any system for which credit is taken in an Operational Safety Requirement (OSR)?

\_\_\_\_\_

X

2. Does work involve Hazardous Chemicals. If so, are they of sufficient quantity and/or type to pose potential for catastrophic consequences? (If applicable, refer to COEM, Section 6.3.6, Appendix 6).

\_\_\_\_\_

X

SECTION B - SAFEGUARDS AND SECURITY SYSTEMS

1. Does work affect Safeguards and Security Systems?

\_\_\_\_\_

X

SECTION C - ENGINEERING SUPPORT PROGRAM (ESP) ELIGIBILITY

1. Work assigned to Engineering Support Program process (COEM 6.0.1)

\_\_\_\_\_

X

SECTION D - PROGRAM ASSIGNMENT AND MANAGEMENT CONCURRENCE

1. Work is assigned to (circle one):

Sect. 6.1

GES

2. Management concurrence/non-concurrence

Sect. 6.1

GES

Ronald B. Heitman

Ronald B. Heitman  
Preparer

11/8/93  
Date

JOHN G. LEHEW

John G. Leheew  
Manager

11/8/93  
Date



## INTEROFFICE CORRESPONDENCE

DATE: November 11, 1993

TO: H. S. Berman, Engineering & Technology, Bldg. 130, X2389

FROM: J. G. Lehew, III, Environmental Restoration Project Engineering, Building 130, X7508 *JGL*

SUBJECT: GENERAL ENGINEERING SERVICES (GES) PILOT PROGRAM - JGL-050-93

### PURPOSE

The purpose of this memo is to request approval for the use of the GES Pilot Program for five projects.

### DISCUSSION

The following projects are proposed for piloting the GES Program, Conduct of Engineering Manual Sections 6.0, 6.0.1, and 6.0.2:

1. Accelerated Sludge Removal Project
2. Environmental Restoration Screening and Shipping Facility
3. Investigated Derived Material Drum Storage
4. Decon Pad Upgrades
5. North Live Firing Range Upgrades

### RESPONSE REQUIREMENT

Please approve.

APPROVED:

H. S. Berman  
Associate General Manager

Date

Ifs

cc:

J. M. Ball  
C. E. Beutler  
W.L. Coulter  
D. L. Dole  
B. K. Evans  
K. P. Ferrera

R. B. Heitland  
T. G. Labrie  
M.M. McDonald  
L. J. McGovern  
G. L. Riley  
D. G. Satterwhite

D. P. Snyder  
T. D. Trangmar  
J. W. Whiting  
M.M. Zelman

## SYSTEM CLASSIFICATION FORM

PROJECT NO. \_\_\_\_\_  
WORK CONTROL NO: 989181 TITLE: ACCELERATED SLUDGE REMOVAL PROJECT

System Name: SLUDGE TRANSFER AND STORAGE SYSTEM

Bldg.: — Location: SOLAR EVAPORATION POND B & C, 78% CLARIFIER AND 750 PAD TENTS

### 6.1.1 SYSTEM REFERENCE DOCUMENTS:

OPERATIONAL REQUIREMENTS DOCUMENT

### 6.1.2 SYSTEM FUNCTIONS AND OPERATING MODES

THE SYSTEM TRANSFERS THE CONTENTS OF POND B & C, AND THE 78% CLARIFIER TO STORAGE TANKS IN TENTS 3, 4, AND 6 ON THE 750 PAD. STORAGE WILL BE FOR 10 YEARS MAXIMUM.

### 6.2 SYSTEM CLASSIFICATION (Identify references from those documents listed in Section 6.1.1 and enter technical justification on appropriate space below).

Category                      1 ☐                      2 ☐                      3 ☒                      4 ☐

Basis: NO CATEGORY 1 OR 2 SAFETY FUNCTIONS ARE  
FULFILLED BY THIS SYSTEM. THE SYSTEM PROVIDES  
CONTAINMENT FOR SOLAR POND SLUDGE AND MUST  
SATISFY NORMAL RADIOLOGICAL AND TOXICOLOGY  
CONTROL REQUIREMENTS

RONALD B. HEITMAN  
Cognizant Engineer                      Print Name

Ronald B. Heitman X2862  
Cognizant Engineer Signature                      Ext/DP

11/15/93  
Date

# ITEM FUNCTIONAL CLASSIFICATION TABLE

Parent System Name: SLURRY TRANSFER AND STORAGE SYSTEM System Category: 1 ☐ 2 ☐ 3 ☒ 4 ☐

NOTE: If component is NSC, all associated parts are NSC and only the classification column (SC/NSC) need be completed.

ITEM NO.	DESCRIPTION OR PART NUMBER	SAFETY FUNCTION	FAILURE MODES	FAILURE EFFECTS	SC/NSC	COMMENTS
1	ASPHALT FOR REPAIR OF THE TSD PAD SURFACE				NSC	

Reviewed by: RONALD D. HEITMAN 11/15/01  
11/16/01

CALCULATION NO: QALC-750-NA-000002

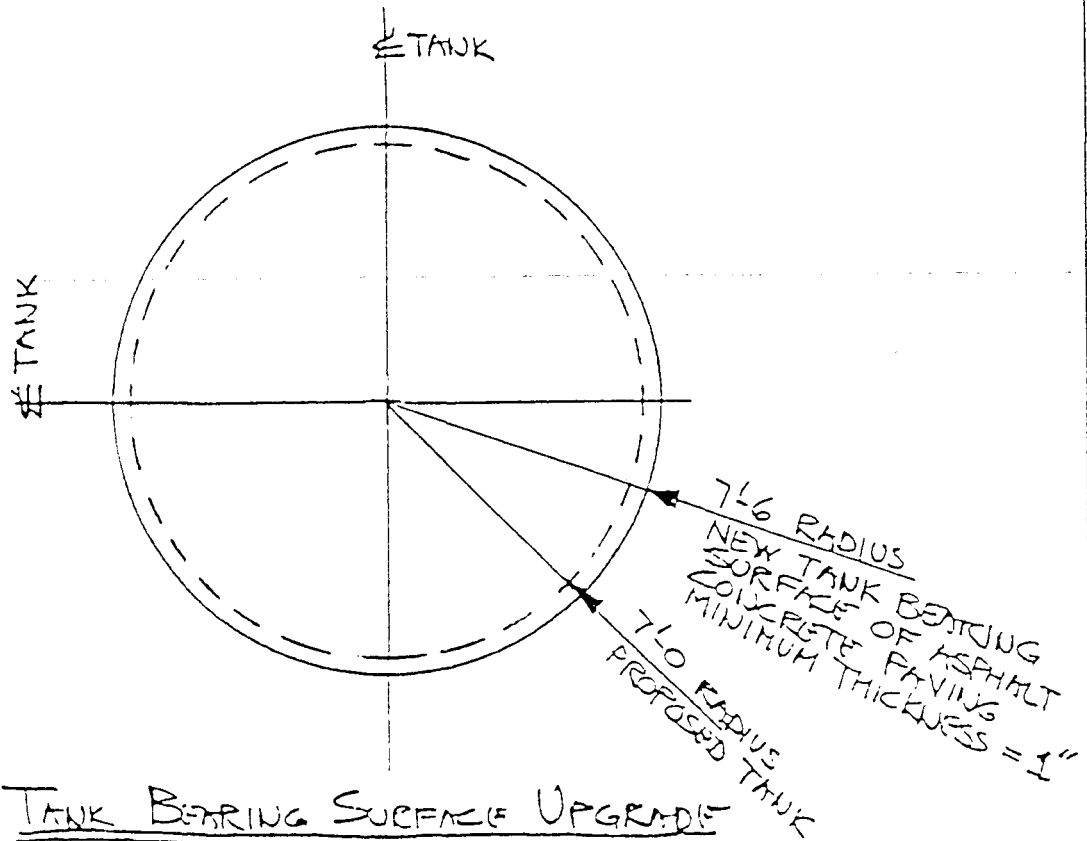
REV.: 0

JOB #: 989179-05

PREPARED BY: J.K. GOODALL 11/11/93

CHECKED BY: H. BARTNIK 11/11/93

SUBJECT: SLUDGE STORAGE TANK FOUNDATION

NOTE:

1. NUMBER & LOCATION OF TANKS REQUIRING UPGRADE TO BE DETERMINED IN THE FIELD BY STRUCTURAL ENGINEERING.
2. MINIMUM THICKNESS OF ASPHALT BEARING SURFACE IS TO BE 1". SEE "TANK PROVISIONS, FOR PLANT PAVING IMPROVEMENTS FY93-94 SITE", SECTION 2600 - ASPHALT CONCRETE PAVING FOR SPECIFICATION OF MATERIAL & INSTALLATION REQUIREMENTS.

Project Number: 989181

Title: ASRP TANK INSTALLATION

con: OVP conlives to the original design package and all subsequent changes

**ALL CONDITIONS TO THIS QVP MUST BE ISSUED VIA A CONDUCT OF ENGINEERING MANUAL APPROVED DESIGN CHANGE**

System Category: 3

Building #: 750 PAD

[illegible]

NOTES:

Fl verification of satisfactory completion for CPFF and FP projects:

Signature

Date \_\_\_\_\_

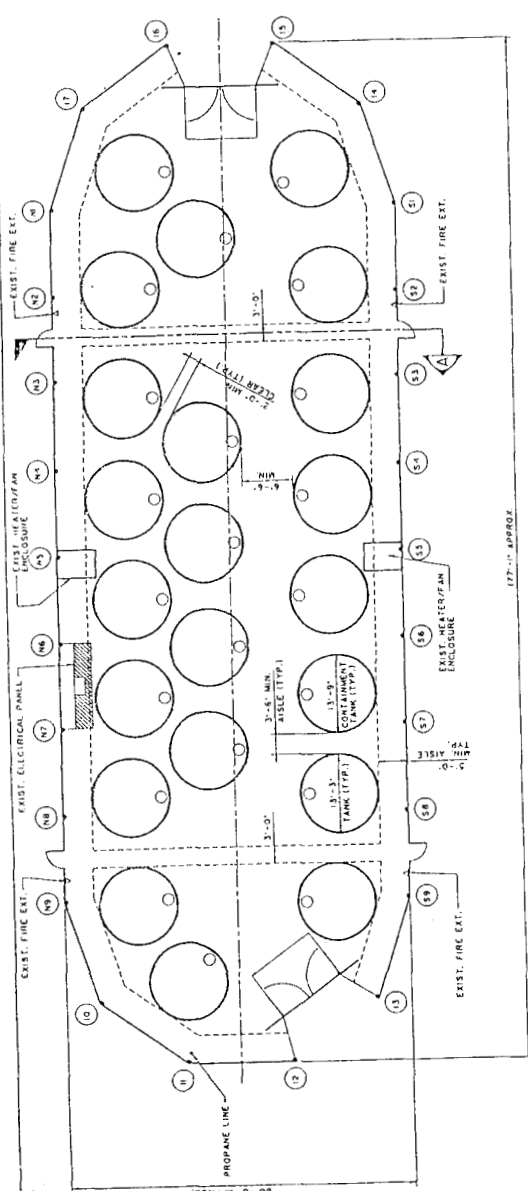
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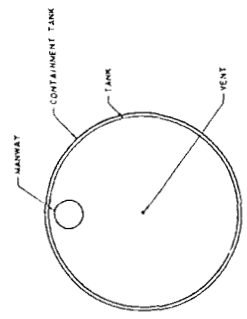


NOTES:

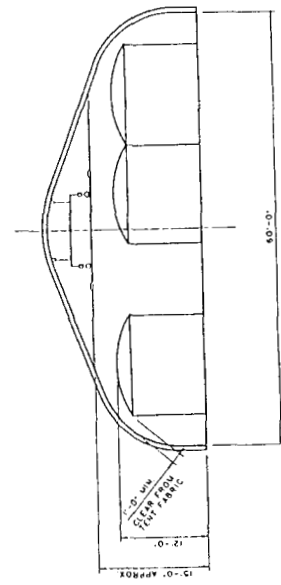
1. THE ERECTION SUBCONTRACTOR SHALL DETERMINE AND MAINTAIN THE PROPER CLEARANCE OF ALL AIRLIFT AND TANK CLEARANCES AS SHOWN ON DRAWINGS.
2. TANKS SHALL NOT BE PLACED ON EXISTING CONCRETE PADS IN FIELD.
3. MAINTAIN 1'-0" CLEAR BETWEEN THE TANK AND TENT FABRIC.
4. AFTER INSTALLATION, PAINT EXTERIOR SURFACES WITH YELLOW PAINT. EXISTING EXTERIOR SURFACES SHALL BE PAINTED WITH YELLOW PAINT. EXISTING EXTERIOR SURFACES WHICH DISCLOSE WITH NEW EXTERIOR PAINT SHALL BE PAINTED WITH YELLOW PAINT.
5. SEE DRAWING 5000-1402 FOR VENT PIPING.
6. SEE DRAWING 5000-1402 FOR VENT PIPING.
7. THE TANKS SHALL BE MARKED WITH THE FOLLOWING INFORMATION TO BE MAINTAINED: THE MARK SHALL BE MAINTAINED THROUGHOUT THE LIFE OF THE TANK. THE MARK SHALL BE MAINTAINED THROUGHOUT THE LIFE OF THE TANK. THE MARK SHALL BE MAINTAINED THROUGHOUT THE LIFE OF THE TANK.
8. A NUMBER SHALL BE PAINTED ON EACH TANK. THE NUMBER SHALL BE PAINTED ON EACH TANK. THE NUMBER SHALL BE PAINTED ON EACH TANK. THE NUMBER SHALL BE PAINTED ON EACH TANK.



TENT 4  
SCALE: 1" = 10'-0"



TANK DETAIL  
SCALE: 1" = 1'-0"

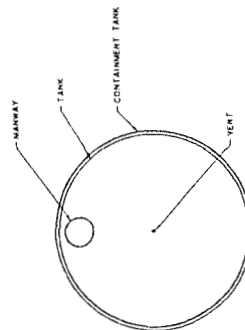


SECTION A  
SCALE: 1" = 1'-0"

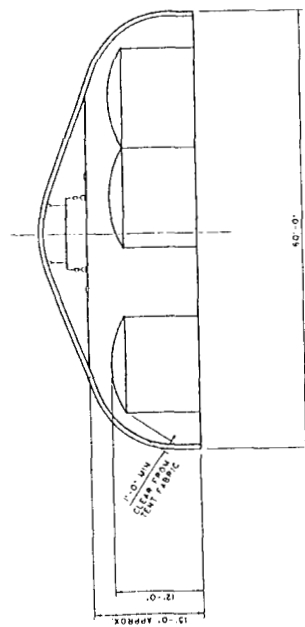
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REVISION	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	
1	11/7/72	REVISION	11/7/72	1	11/7/72	11/7/72	11/7/72	11/7/72	
2	11/7/72	REVISION	11/7/72	2	11/7/72	11/7/72	11/7/72	11/7/72	
3	11/7/72	REVISION	11/7/72	3	11/7/72	11/7/72	11/7/72	11/7/72	
4	11/7/72	REVISION	11/7/72	4	11/7/72	11/7/72	11/7/72	11/7/72	
5	11/7/72	REVISION	11/7/72	5	11/7/72	11/7/72	11/7/72	11/7/72	
6	11/7/72	REVISION	11/7/72	6	11/7/72	11/7/72	11/7/72	11/7/72	
7	11/7/72	REVISION	11/7/72	7	11/7/72	11/7/72	11/7/72	11/7/72	
8	11/7/72	REVISION	11/7/72	8	11/7/72	11/7/72	11/7/72	11/7/72	
9	11/7/72	REVISION	11/7/72	9	11/7/72	11/7/72	11/7/72	11/7/72	
10	11/7/72	REVISION	11/7/72	10	11/7/72	11/7/72	11/7/72	11/7/72	
11	11/7/72	REVISION	11/7/72	11	11/7/72	11/7/72	11/7/72	11/7/72	
12	11/7/72	REVISION	11/7/72	12	11/7/72	11/7/72	11/7/72	11/7/72	
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14	11/7/72	REVISION	11/7/72	14	11/7/72	11/7/72	11/7/72	11/7/72	
15	11/7/72	REVISION	11/7/72	15	11/7/72	11/7/72	11/7/72	11/7/72	
16	11/7/72	REVISION	11/7/72	16	11/7/72	11/7/72	11/7/72	11/7/72	
17	11/7/72	REVISION	11/7/72	17	11/7/72	11/7/72	11/7/72	11/7/72	
18	11/7/72	REVISION	11/7/72	18	11/7/72	11/7/72	11/7/72	11/7/72	
19	11/7/72	REVISION	11/7/72	19	11/7/72	11/7/72	11/7/72	11/7/72	
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21	11/7/72	REVISION	11/7/72	21	11/7/72	11/7/72	11/7/72	11/7/72	
22	11/7/72	REVISION	11/7/72	22	11/7/72	11/7/72	11/7/72	11/7/72	
23	11/7/72	REVISION	11/7/72	23	11/7/72	11/7/72	11/7/72	11/7/72	
24	11/7/72	REVISION	11/7/72	24	11/7/72	11/7/72	11/7/72	11/7/72	
25	11/7/72	REVISION	11/7/72	25	11/7/72	11/7/72	11/7/72	11/7/72	
26	11/7/72	REVISION	11/7/72	26	11/7/72	11/7/72	11/7/72	11/7/72	
27	11/7/72	REVISION	11/7/72	27	11/7/72	11/7/72	11/7/72	11/7/72	
28	11/7/72	REVISION	11/7/72	28	11/7/72	11/7/72	11/7/72	11/7/72	
29	11/7/72	REVISION	11/7/72	29	11/7/72	11/7/72	11/7/72	11/7/72	
30	11/7/72	REVISION	11/7/72	30	11/7/72	11/7/72	11/7/72	11/7/72	
31	11/7/72	REVISION	11/7/72	31	11/7/72	11/7/72	11/7/72	11/7/72	
32	11/7/72	REVISION	11/7/72	32	11/7/72	11/7/72	11/7/72	11/7/72	
33	11/7/72	REVISION	11/7/72	33	11/7/72	11/7/72	11/7/72	11/7/72	
34	11/7/72	REVISION	11/7/72	34	11/7/72	11/7/72	11/7/72	11/7/72	
35	11/7/72	REVISION	11/7/72	35	11/7/72	11/7/72	11/7/72	11/7/72	
36	11/7/72	REVISION	11/7/72	36	11/7/72	11/7/72	11/7/72	11/7/72	
37	11/7/72	REVISION	11/7/72	37	11/7/72	11/7/72	11/7/72	11/7/72	
38	11/7/72	REVISION	11/7/72	38	11/7/72	11/7/72	11/7/72	11/7/72	
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42	11/7/72	REVISION	11/7/72	42	11/7/72	11/7/72	11/7/72	11/7/72	
43	11/7/72	REVISION	11/7/72	43	11/7/72	11/7/72	11/7/72	11/7/72	
44	11/7/72	REVISION	11/7/72	44	11/7/72	11/7/72	11/7/72	11/7/72	
45	11/7/72	REVISION	11/7/72	45	11/7/72	11/7/72	11/7/72	11/7/72	
46	11/7/72	REVISION	11/7/72	46	11/7/72	11/7/72	11/7/72	11/7/72	
47	11/7/72	REVISION	11/7/72	47	11/7/72	11/7/72	11/7/72	11/7/72	
48	11/7/72	REVISION	11/7/72	48	11/7/72	11/7/72	11/7/72	11/7/72	
49	11/7/72	REVISION	11/7/72	49	11/7/72	11/7/72	11/7/72	11/7/72	
50	11/7/72	REVISION	11/7/72	50	11/7/72	11/7/72	11/7/72	11/7/72	
51	11/7/72	REVISION	11/7/72	51	11/7/72	11/7/72	11/7/72	11/7/72	
52	11/7/72	REVISION	11/7/72	52	11/7/72	11/7/72	11/7/72	11/7/72	
53	11/7/72	REVISION	11/7/72	53	11/7/72	11/7/72	11/7/72	11/7/72	
54	11/7/72	REVISION	11/7/72	54	11/7/72	11/7/72	11/7/72	11/7/72	
55	11/7/72	REVISION	11/7/72	55	11/7/72	11/7/72	11/7/72	11/7/72	
56	11/7/72	REVISION	11/7/72	56	11/7/72	11/7/72	11/7/72	11/7/72	
57	11/7/72	REVISION	11/7/72	57	11/7/72	11/7/72	11/7/72	11/7/72	
58	11/7/72	REVISION	11/7/72	58	11/7/72	11/7/72	11/7/72	11/7/72	
59	11/7/72	REVISION	11/7/72	59	11/7/72	11/7/72	11/7/72	11/7/72	
60	11/7/72	REVISION	11/7/72	60	11/7/72	11/7/72	11/7/72	11/7/72	
61	11/7/72	REVISION	11/7/72	61	11/7/72	11/7/72	11/7/72	11/7/72	
62	11/7/72	REVISION	11/7/72	62	11/7/72	11/7/72	11/7/72	11/7/72	
63	11/7/72	REVISION	11/7/72	63	11/7/72	11/7/72	11/7/72	11/7/72	
64	11/7/72	REVISION	11/7/72	64	11/7/72	11/7/72	11/7/72	11/7/72	
65	11/7/72	REVISION	11/7/72	65	11/7/72	11/7/72	11/7/72	11/7/72	
66	11/7/72	REVISION	11/7/72	66	11/7/72	11/7/72	11/7/72	11/7/72	
67	11/7/72	REVISION	11/7/72	67	11/7/72	11/7/72	11/7/72	11/7/72	
68	11/7/72	REVISION	11/7/72	68	11/7/72	11/7/72	11/7/72	11/7/72	
69	11/7/72	REVISION	11/7/72	69	11/7/72	11/7/72	11/7/72	11/7/72	
70	11/7/72	REVISION	11/7/72	70	11/7/72	11/7/72	11/7/72	11/7/72	
71	11/7/72	REVISION	11/7/72	71	11/7/72	11/7/72	11/7/72	11/7/72	
72	11/7/72	REVISION	11/7/72	72	11/7/72	11/7/72	11/7/72	11/7/72	
73	11/7/72	REVISION	11/7/72	73	11/7/72	11/7/72	11/7/72	11/7/72	
74	11/7/72	REVISION	11/7/72	74	11/7/72	11/7/72	11/7/72	11/7/72	
75	11/7/72	REVISION	11/7/72	75	11/7/72	11/7/72	11/7/72	11/7/72	
76	11/7/72	REVISION	11/7/72	76	11/7/72	11/7/72	11/7/72	11/7/72	
77	11/7/72	REVISION	11/7/72	77	11/7/72	11/7/72	11/7/72	11/7/72	
78	11/7/72	REVISION	11/7/72	78	11/7/72	11/7/72	11/7/72	11/7/72	
79	11/7/72	REVISION	11/7/72	79	11/7/72	11/7/72	11/7/72	11/7/72	
80	11/7/72	REVISION	11/7/72	80	11/7/72	11/7/72	11/7/72	11/7/72	
81	11/7/72	REVISION	11/7/72	81	11/7/72	11/7/72	11/7/72	11/7/72	
82	11/7/72	REVISION	11/7/72	82	11/7/72	11/7/72	11/7/72	11/7/72	
83	11/7/72	REVISION	11/7/72	83	11/7/72	11/7/72	11/7/72	11/7/72	
84	11/7/72	REVISION	11/7/72	84	11/7/72	11/7/72	11/7/72	11/7/72	
85	11/7/72	REVISION	11/7/72	85	11/7/72	11/7/72	11/7/72	11/7/72	
86	11/7/72	REVISION	11/7/72	86	11/7/72	11/7/72	11/7/72	11/7/72	
87	11/7/72	REVISION	11/7/72	87	11/7/72	11/7/72	11/7/72	11/7/72	
88	11/7/72	REVISION	11/7/72	88	11/7/72	11/7/72	11/7/72	11/7/72	
89	11/7/72	REVISION	11/7/72	89	11/7/72	11/7/72	11/7/72	11/7/72	
90	11/7/72	REVISION	11/7/72	90	11/7/72	11/7/72	11/7/72	11/7/72	
91	11/7/72	REVISION	11/7/72	91	11/7/72	11/7/72	11/7/72	11/7/72	
92	11/7/72	REVISION	11/7/72	92	11/7/72	11/7/72	11/7/72	11/7/72	
93	11/7/72	REVISION	11/7/72	93	11/7/72	11/7/72	11/7/72	11/7/72	
94	11/7/72	REVISION	11/7/72	94	11/7/72	11/7/72	11/7/72	11/7/72	
95	11/7/72	REVISION	11/7/72	95	11/7/72	11/7/72	11/7/72	11/7/72	
96	11/7/72	REVISION	11/7/72	96	11/7/72	11/7/72	11/7/72	11/7/72	
97	11/7/72	REVISION	11/7/72	97	11/7/72	11/7/72	11/7/72	11/7/72	
98	11/7/72	REVISION	11/7/72	98	11/7/72	11/7/72	11/7/72	11/7/72	
99	11/7/72	REVISION	11/7/72	99	11/7/72	11/7/72	11/7/72	11/7/72	
100	11/7/72	REVISION	11/7/72	100	11/7/72	11/7/72	11/7/72	11/7/72	

[illegible]

0.1000



TANK DETAIL



## SECTION A

SCAR: 1-01-9.

[illegible][illegible]

## DESIGN MODIFICATION PACKAGE

TITLE: ACCELERATED SLUDGE REMOVAL PROJECT (P.N. 989181)  
STORAGE TANK VENT SYSTEMS PACKAGE

DATE OF RELEASE: December 1, 1993

CONCURRENCE:

*12/1/93*  
*T. D. Beckman (for TDB)*  
Thomas d. Beckman, Project Manager

PREPARED BY:

*R. B. Heitland 12/1/93*  
Ronald B. Heitland, Project Engineer

APPROVED BY:

*J. G. Lehew 12/1/93*  
John G. Lehew, Project Engineering Manager

### DISTRIBUTION

Thomas Beckman - Project Manager, Bldg 080  
Joe Mellon - Program Manager, Bldg 080  
Joe Roberts - Operations Manager, T893B  
Scott Kozel - Systems Engineering, T452A  
Dave Chojnacki - Health & Safety, T690C  
Doug Perryman - Health & Safety, T452C  
David Warfield - Facilities Quality Engineering, T130A  
Doug Hughes - Instrumentation & Controls, T130J  
Bob Campbell - Environmental Design Engineering, Bldg 030  
Darrol Crabb - Construction Management, T130F  
S. Seyedian - J. A. Jones Construction, T690A  
Ken Brusegaard - Cost Estimating, T130D  
Tom Bourgeois - Construction Management, T764B  
Al Smith - Maintenance Planning, T130B  
Phil Ciullo - DOE/CED, Bldg 116

### DESIGN MODIFICATION PACKAGE (DMP) CONTENTS

	<u>DOCUMENT</u>	<u>INCLUDED IN DMP</u>	<u>REF. LOCATION</u>
1.	OBJECTIVE AND TECHNICAL SCOPE		PROJECT FILE
2.	ENGINEERING WORK PLAN		PROJECT FILE
3.	GENERAL ENGINEERING SERVICES SCREEN		PROJECT FILE
4.	AGM APPROVAL LETTER (APPROVAL FOR USE OF COEM PROC. 6.02)		PROJECT FILE
5.	SYSTEMS CLASSIFICATION FORM	X	
6.	ITEM FUNCTIONAL CLASSIFICATION FORM	X	
7.	CALCULATIONS CALC. NO.: CALC-750-NA-000003 VENT PIPE SUPPORTS		ENGINEERING DOC. CONTROL
8.	QUALITY VERIFICATION PLAN	X	
9.	DESCRIPTION OF WORK TANK VENTING PLAN	X	
10.	SUPPLEMENTAL BILL OF MATERIALS	X	
11.	DRAWINGS		
	DWG. NO. 51006-401	X	
	DWG. NO. 51006-402	X	
	DWG. NO. 51006-403	X	
	DWG. NO. 51006-404	X	

# SYSTEM CLASSIFICATION FORM

WORK CONTROL NO: 989181 TITLE: ACCELERATED SOLID REMOVAL PROJECT

System Name: TANK VENT SYSTEM

Bldg.:        Location: 750 PAD, TENTS 3, 4, 6

## 6.1.1 SYSTEM REFERENCE DOCUMENTS:

OPERATIONAL REQUIREMENTS DOCUMENT

## 6.1.2 SYSTEM FUNCTIONS AND OPERATING MODES

PROVIDES VENTING OF GASES TO THE EXTERIOR OF THE TENTS AS REQUIRED BY INDUSTRIAL HYGIENE. NO FILTRATION OF GASES ARE REQUIRED PER INDUSTRIAL HYGIENE. THE TANKS ARE DESIGNED AS ATMOSPHERIC TANKS (NOT PRESSURE VESSELS)

## 6.2 SYSTEM CLASSIFICATION

(Identify references from those documents listed in Section 6.1.1 and enter technical justification on appropriate space below).

Category 1 ☐ 2 ☐ 3 ☐ 4 ☒

Basis: DOES NOT MEET THE CRITERIA FOR

CLASSIFICATION IN CATEGORY 1, 2, OR 3

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Ronald B. Henderson 2862/000174 11/30/93  
Cognizant Engineer Print Name Cognizant Engineer Signature Ex/DP Date

# ITEM FUNCTIONAL CLASSIFICATION TABLE

Project No. 929181  
 Work Control No. 1  
 Page 1 of 1

Parent System Name: ACCELERATED SURGE REMOVAL PROJECT  
TANK VENT SYSTEM

System Category: 1 ☐ 2 ☐ 3 ☐ 4 ☒

NOTE: If component is NSC, all associated parts are NSC and only the classification column (SC/NSC) need be completed.

ITEM NO.	DESCRIPTION OR PART NUMBER	SAFETY FUNCTION	FAILURE MODES	FAILURE EFFECTS	SC/NSC	COMMENTS
1	ALL ITEM'S SHOWN ON DWG. NO.'S 51006-401, 51006-402, 51006-403				NSC	

Reviewed: B. Heitman  
 11/13/07





## Description of Work

### Accelerated Sludge Removal

#### Tank Venting Plan

The purpose of this project is to install a passive vent for the HDPE tanks that will hold the 207B and 207C sludge. The tanks shall be supplied with a 2" PVC FPT fitting located in the center of the tank. This fitting shall be attached to 2" flexible spa hose that shall be field routed to the 4" PVC header. The spa hose can be solvent welded with PVC cement. The header shall exit the tent through a pre-fabricated 6" diameter sleeve. The sleeve shall be 1 ft. in length and attached to the pipe with a hose clamp with 6" of slack to allow for movement in the canvas as shown on drawing 401. The sleeve shall be furnished with a 3" gusset to allow welding to the existing liner. The area to be welded shall be cleaned with MEK and the sleeve shall be welded with a hot air welder. A reinforcing patch 12"x12" shall be installed on the interior liner and the hole shall be cut where the pipe shall penetrate the tent. The vent opening shall be covered with a hardware cloth or screen to keep birds out of the vent system. The screen shall be attached with a hose clamp. This was not called out on the drawing, but is listed on the attached supplemental BOM.





## CANVAS SPECIALTY

7344 East Bandini Blvd.  
P.O. Box 22258  
Los Angeles, CA 90022-0258  
(213) 723-8311  
(213) 722-1156  
(714) 523-1032

November 4, 1993

Mr. Ralph Pacheco  
E.G. & G. Inc.  
11834 Idaho Drive  
Aurora, Colorado 80012

Re: Hood For Vent Opening

Dear Mr. Pacheco:

As per our conversation, I believe that it would be relatively simple to create a fabric hood, with a fabric flange at the bottom, that could be cemented in place at the opening.

We would make the opening to fit your size pipe, and extend the hood whatever length you feel is necessary. You could then tie the hood around the vent and seal it with tape and even silicone to keep it watertight.

At the moment this is all that I can think of to handle your needs. However, I will bring this subject to the attention of our factory manager and see if he has any other possible solutions.

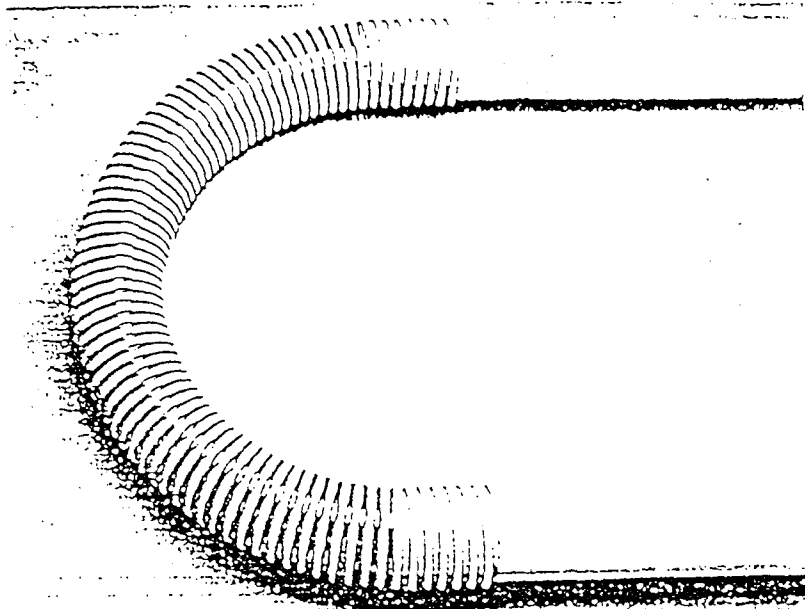
Sincerely,

CANVAS SPECIALTY

Irwin Sack

IS/gg

# LARGE-DIAMETER PIPE-SIZE PVC HOSE



- Comes in sizes from 2" to 12"
- The smooth I.D. matches the O.D. of rigid PVC pipe.
- Can be cemented over PVC pipe.
- Flexible and clear.
- A temperature range from 13°F to +155°F.
- Vacuum or pressure service.

## APPLICATIONS:

- Mining
- Landfill methane gas recovery
- Marine suction
- Industrial

## FLEXIBLE PVC TO RIGID PVC CEMENT

ORDER: 3480-(Size No.) PVC CEMENT

Use 3484 Pipe Primer on page 66.

Size No.	Size	Price Each
-030	Quart	\$12.25
-040	Gallon	41.85

## ORDER: 1014-(Size No.) PIPE-SIZE I.D. PVC HOSE

Size No.	Nom. Size (in.)	I.D. (in.)	O.D. (in.)	Bend Radius (in.)	Work. Pressure (psi)	Vacuum Rating (Hg)	Wt./ Ft. (lbs.)	Price/ Ft.
-020	2	2.375	2.76	2.6	35	29.8	0.68	\$3.47
-030	3	3.500	4.00	3.5	30	29.8	1.20	6.16
-040	4	4.500	5.11	6.5	30	28.0	1.70	8.66
-050	6	6.625	7.44	11.5	30	28.0	3.57	19.46
-060	8	8.625	9.59	22.0	30	26.0	5.35	30.36
-100	10	10.750	11.71	34.0	27	27.0	6.83	39.92
-120	12	12.750	13.70	44.0	23	25.0	9.00	60.99

Standard coil 100 ft.

## CLAMPS?

Use Part No. 0953 Power Lock Clamps especially designed for this hose. See page 50 for details.

*Dale Griffith*

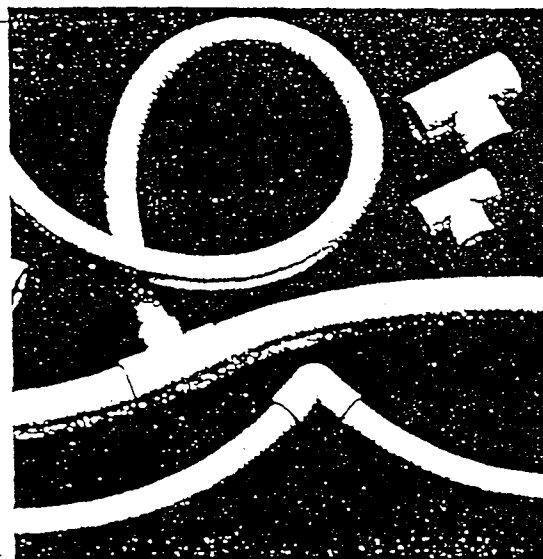
# FLEXIBLE PVC PIPE-SIZE TUBING

This flexible tubing has the same O.D. as rigid PVC pipe (IPS), so it can be cemented into rigid PVC fittings (either Schedule 40 or 80). The cream-colored hose has a smooth vinyl surface that will not rot, check or mark the surfaces it touches. All sizes have rigid inner-wall reinforcement that gives the hose higher pressure ratings than other unreinforced products. The 1/2" size is braided-reinforced. All coils measure 100 feet in length. Not NSF approved for potable water.

## ORDER: 1018-(Size No.) PVC PIPE-SIZE O.D. TUBING

Size No.	Price \$/ft.		IPS Pipe Size (in.)	O.D. (in.)	Min. Bend Rad. (in.)	Burst Pressure (psi)†	Max. Working Pressure @ 72°F (psi)	Weight (lbs./ ft.)
	Full Coil	Cut Length						
-005"	\$ .70	\$1.05	1/2	.844	5	375	125	.14
-007"	.88	1.32	3/4	1.060	5	375	125	.21
-010	.97	1.46	1	1.323	6	300	100	.27
-012	1.33	2.00	1-1/4	1.665	10	240	80	.36
-015	1.41	2.11	1-1/2	1.902	14	210	70	.41
-020	2.05	3.08	2	2.352	18	210	70	.59

†Average values measured at 72°F.



Smooth O.D. matches I.D. of rigid PVC fittings.

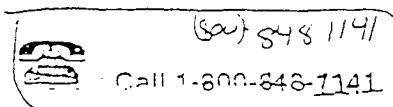


*Canvas Specialties*  
(213) 723-8311

*Erwin Sark*



(213) 722-1156  
(714) 523-1032



# PVC FITTINGS - SCHEDULE 40

A WORD ABOUT SCHEDULE 40 FITTINGS: These standard weight fittings are designed for use with Schedule 40 PVC pipe, and for most class pipe (pressure rated) systems. Applications include irrigation lines, plant service water, utility piping and potable water lines.

These fittings meet or exceed the requirements of ASTM D-2466-76a for socket type PVC fittings. The material is Type 1, Grade 1 white PVC (cell classification 12454B) and conform to ASTM D1784-75.

**WARNING: DO NOT TEST OR USE PVC PIPING FOR AIR OR COMPRESSED GASES.**



TEE  
SOC x SOC x SOC

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	401-005	.94
3/4	401-007	1.06
1	401-010	1.99
1-1/4	401-012	3.13
1-1/2	401-015	3.79
2	401-020	5.51
2-1/2	401-025	18.16
3	401-030	23.83
4	401-040	43.14
5	401-050	104.23
6	401-060	145.30
8	401-080	336.96
3/8x3/8x1/2	401-053	2.56
1/2x1/2x3/4	401-074	1.96
1/2x1/2x1	401-075	3.66
3/4x1/2x1/2	401-094	1.79
3/4x1/2x3/4	401-095	1.79
3/4x3/4x1/2	401-101	1.22
3/4x3/4x1	401-102	3.51
1x1/2x1	401-122	3.51
1x3/4x1/2	401-124	3.51
1x3/4x3/4	401-125	3.51
1x3/4x1	401-126	3.51
1x1x1/2	401-130	2.10
1x1x3/4	401-131	2.28
1x1x1-1/4	401-132	4.71
1x1x1-1/2	401-133	6.10



TEE  
SOC x SOC x SOC (CONT.)

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1-1/4x1x1/2	401-156	4.81
1-1/4x1x3/4	401-157	4.81
1-1/4x1x1	401-158	4.81
1-1/4x1-1/4x1/2	401-166	3.41
1-1/4x1-1/4x3/4	401-167	3.41
1-1/4x1-1/4x1	401-168	3.41
1-1/4x1-1/4x1-1/2	401-169	6.22
1-1/4x1-1/4x2	401-170	8.56
1-1/2x1-1/4x1/2	401-199	6.00
1-1/2x1-1/4x3/4	401-201	6.00
1-1/2x1-1/4x1	401-202	6.00
1-1/2x1-1/2x1/2	401-209	6.00
1-1/2x1-1/2x3/4	401-210	6.00
1-1/2x1-1/2x1	401-211	6.00
1-1/2x1-1/2x1-1/4	401-212	6.00
1-1/2x1-1/2x2	401-213	8.55
1-1/2x1-1/2x2-1/2	401-214	18.88
2x1-1/2x3/4	401-238	8.55
2x1-1/2x1	401-239	8.55
2x1-1/2x1-1/2	401-241	8.55
2x2x1/2	401-247	5.89
2x2x3/4	401-248	5.89
2x2x1	401-249	5.89
2x2x1-1/4	401-250	5.89
2x2x1-1/2	401-251	5.89
2-1/2x2-1/2x1/2	401-287	18.13
2-1/2x2-1/2x3/4	401-288	18.13



TEE  
SOC x SOC x SOC (CONT.)

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
2-1/2x2-1/2x1	401-289	18.13
2-1/2x2-1/2x1-1/4	401-290	18.13
2-1/2x2-1/2x1-1/2	401-291	18.13
2-1/2x2-1/2x2	401-292	18.13
3x3x1/2	401-333	25.93
3x3x3/4	401-334	25.93
3x3x1	401-335	25.93
3x3x1-1/4	401-336	25.93
3x3x1-1/2	401-337	25.93
3x3x2	401-338	25.93
3x3x4	401-342	44.56
4x4x3/4	401-416	43.14
4x4x1	401-417	43.14
4x4x1-1/4	401-418	43.14
4x4x1-1/2	401-419	43.14
4x4x2	401-420	43.14
4x4x3	401-422	43.14
5x5x2	401-486	101.20
5x5x3	401-488	101.20
5x5x4	401-490	101.20
6x6x2	401-528	145.30
6x6x3	401-530	145.30
6x6x4	401-532	145.30
8x8x3	401-580	336.96
8x8x4	401-582	336.96
8x8x6	401-585	336.96

NOTE: To order primer, solvent cement or teflon tape see pages 24 and 25.

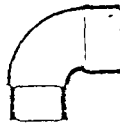
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PIPE AND FITTINGS

# PVC FITTINGS - SCHEDULE 40

90° STREET  
ELBOW  
SPIG x SOC



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	409-005	2.10
3/4	409-007	2.57
1	409-010	4.47
1-1/4	409-012	5.32
1-1/2	409-015	5.89
2	409-020	11.46

COUPLING  
SOC x SOC



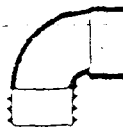
NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	429-005	.50
3/4	429-007	.68
1	429-010	1.17
1-1/4	429-012	1.61
1-1/2	429-015	1.72
2	429-020	2.68
2-1/2	429-025	5.89
3	429-030	9.23
4	429-040	13.34
5	429-050	24.44
6	429-060	42.19
8	429-080	76.76

45° ELBOW  
SOC x SOC



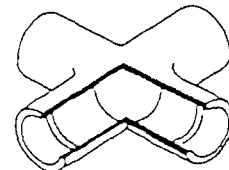
NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	417-005	1.22
3/4	417-007	1.90
1	417-010	2.28
1-1/4	417-012	3.22
1-1/2	417-015	4.01
2	417-020	5.23
2-1/2	417-025	13.59
3	417-030	21.10
4	417-040	37.89
5	417-050	75.16
6	417-060	93.75
8	417-080	225.09

90° STREET  
ELBOW  
MPT x SOC



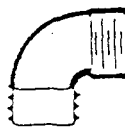
NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	410-005	1.61
3/4	410-007	1.90
1	410-010	3.21
1-1/4	410-012	4.47
1-1/2	410-015	4.66
2	410-020	11.48

CROSS  
SOC



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	420-005	2.63
3/4	420-007	4.74
1	420-010	5.89
1-1/4	420-012	7.79
1-1/2	420-015	8.84
2	420-020	13.02
2-1/2	420-025	27.60
3	420-030	33.86
4	420-040	50.17
3x3x1x1	420-335	29.57
3x3x1-1/2x1-1/2	420-337	29.57
3x3x2x2	420-338	29.57
4x4x2x2	420-420	49.46

90° STREET  
ELBOW  
MPT x FPT



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	412-005	2.19
3/4	412-007	2.68
1	412-010	4.59
1-1/4	412-012	5.70
1-1/2	412-015	6.16
2	412-020	11.78

FITTING  
ADAPTER  
SPIG x FPT



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	478-005	.95
3/4	478-007	1.10
1	478-010	1.76
1-1/4	478-012	2.44
1-1/2	478-015	3.02
2	478-020	4.46
4	478-040	17.79

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PIPE AND FITTINGS

# PVC FITTINGS - SCHEDULE 40



TEE  
SOC x SOC x FPT

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	402-005	1.22
3/4	402-007	1.90
1	402-010	3.51
1-1/4	402-012	5.62
1-1/2	402-015	7.31
2	402-020	9.24
2-1/2	402-025	28.16
3	402-030	35.94
4	402-040	54.86
1/2x1/2x1/8	402-071	2.66
1/2x1/2x3/4	402-074	2.66
3/4x1/2x1/2	402-094	1.88
3/4x1/2x3/4	402-095	1.88
3/4x3/4x1/2	402-101	1.61
1x3/4x1/2	402-124	3.52
1x1x1/2	402-130	2.46
1x1x3/4	402-131	3.52
1-1/4x1x1/2	402-156	5.61
1-1/4x1x1	402-158	5.61
1-1/4x1-1/4x1/2	402-166	5.89
1-1/4x1-1/4x3/4	402-167	5.89
1-1/4x1-1/4x1	402-168	5.89
1-1/2x1-1/4x1/2	402-199	7.31
1-1/2x1-1/4x3/4	402-201	7.31
1-1/2x1-1/4x1	402-202	7.31
1-1/2x1-1/2x1/2	402-209	7.31
1-1/2x1-1/2x3/4	402-210	7.31
1-1/2x1-1/2x1	402-211	7.31



TEE  
SOC x SOC x FPT (CONT.)

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1-1/2x1-1/2x1-1/4	402-212	7.31
2x1-1/2x3/4	402-238	9.19
2x1-1/2x1	402-239	9.19
2x2x1/2	402-247	9.19
2x2x3/4	402-248	9.19
2x2x1	402-249	9.19
2x2x1-1/4	402-250	9.19
2x2x1-1/2	402-251	9.19
2-1/2x2-1/2x1/2	402-287	19.93
2-1/2x2-1/2x3/4	402-288	19.93
2-1/2x2-1/2x1	402-289	19.93
2-1/2x2-1/2x1-1/4	402-290	19.93
2-1/2x2-1/2x1-1/2	402-291	19.93
3x3x1/2	402-333	28.46
3x3x3/4	402-334	28.46
3x3x1	402-335	28.46
3x3x1-1/4	402-336	28.46
3x3x1-1/2	402-337	28.46
3x3x2	402-338	28.46
4x4x1	402-417	47.51
4x4x1-1/2	402-419	47.51
4x4x2	402-420	47.51
4x4x3	402-422	47.51
5x5x4	402-490	124.15
6x6x2	402-528	161.06
6x6x3	402-530	161.06
6x6x4	402-532	161.06
8x8x3	402-580	348.37
8x8x4	402-582	348.37



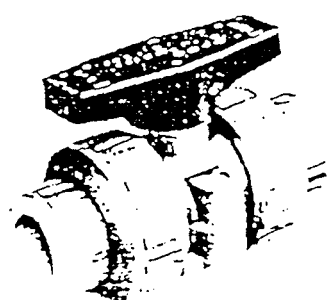
90° ELBOW  
SOC x SOC

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	406-005	.76
3/4	406-007	.84
1	406-010	1.51
1-1/4	406-012	2.66
1-1/2	406-015	2.83
2	406-020	4.47
2-1/2	406-025	13.57
3	406-030	16.24
4	406-040	29.08
5	406-050	75.16
6	406-060	92.47
8	406-080	238.13
3/4x1/2	406-101	1.51
1x1/2	406-130	2.23
1x3/4	406-131	2.68
1-1/4x1/2	406-166	4.23
1-1/4x3/4	406-167	4.23
1-1/4x1	406-168	4.23
1-1/2x1/2	406-209	6.70
1-1/2x1	406-211	6.70
2x1-1/2	406-251	11.46



90° ELBOW  
SOC x FPT

NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	407-005	.94
3/4	407-007	1.06
1	407-010	1.99
1-1/4	407-012	3.32
1-1/2	407-015	3.66
2	407-020	9.57
2-1/2	407-025	23.60
3	407-030	35.36
4	407-040	53.64



DON'T FORGET TO ORDER  
VALVES. SEE SECTION 4

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# PVC FITTINGS - SCHEDULE 40

CAP  
SOC



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2	447-005	.68
3/4	447-007	.78
1	447-010	1.24
1-1/4	447-012	1.72
1-1/2	447-015	1.90
2	447-020	2.29
2-1/2	447-025	7.31
3	447-030	7.98
4	447-040	18.16
5	447-050	30.51
6	447-060	43.52
8	447-080	109.36

NOTE: For larger diameter fittings, see pages 20.

REDUCING  
BUSHING  
MPT x FPT



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
3/8x1/4	439-052	3.52
1/2x1/4	439-072	3.52
1/2x3/8	439-073	3.52
3/4x1/4	439-098	2.19
3/4x3/8	439-099	2.19
3/4x1/2	439-101	2.19
1x1/2	439-130	3.06
1x3/4	439-131	3.06
1-1/4x1/2	439-166	4.56
1-1/4x3/4	439-167	4.56
1-1/4x1	439-168	4.56
1-1/2x3/4	439-209	5.51
1-1/2x1/2	439-210	5.51
1-1/2x1	439-211	5.51
1-1/2x1-1/4	439-212	5.51
2x1	439-249	5.89
2x1-1/4	439-250	5.89
2x1-1/2	439-251	5.89
2-1/2x2	439-292	20.65
3x2	439-338	24.34
3x2-1/2	439-339	24.34

REDUCING  
BUSHING  
SPIG x SOC

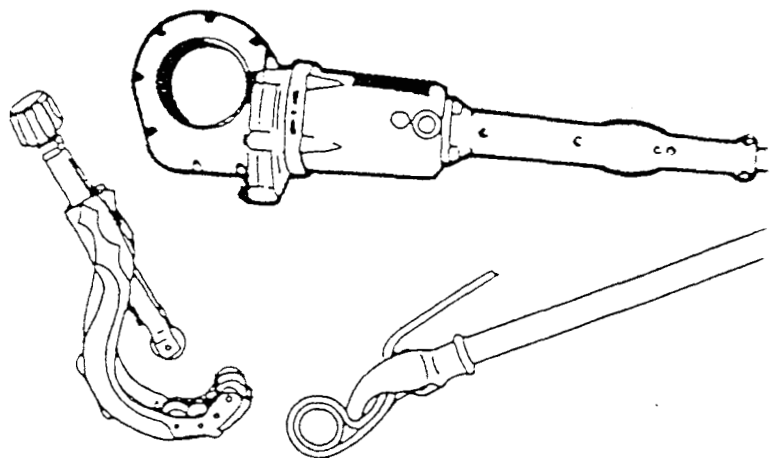


NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
1/2x1/4	437-072	1.43
1/2x3/8	437-073	1.43
3/4x1/2	437-101	.78
1x1/2	437-130	1.44
1x3/4	437-131	1.44
1-1/4x1/2	437-166	1.90
1-1/4x3/4	437-167	1.90
1-1/4x1	437-168	1.90
1-1/2x1/2	437-209	2.00
1-1/2x3/4	437-210	2.00
1-1/2x1	437-211	2.00
1-1/2x1-1/4	437-212	2.00
2x1/2	437-247	3.32
2x3/4	437-248	3.32
2x1	437-249	3.32
2x1-1/4	437-250	3.32
2x1-1/2	437-251	3.32
2-1/2x1/2	437-287	5.33
2-1/2x3/4	437-288	5.33
2-1/2x1	437-289	5.33
2-1/2x1-1/4	437-290	5.33
2-1/2x1-1/2	437-291	5.33
2-1/2x2	437-292	5.33

REDUCING  
BUSHING  
SPIG x SOC (CONT.)



NOMINAL PIPE SIZE (IN.)	PART NUMBER	PRICE EACH (\$)
3x3/4	437-334	7.31
3x1	437-335	7.31
3x1-1/4	437-336	7.31
3x1-1/2	437-337	7.31
3x2	436-338	7.31
3x2-1/2	437-339	7.31
4x2	437-420	17.31
4x2-1/2	437-421	17.31
4x3	437-422	17.31
5x2	437-486	24.34
5x3	437-488	24.34
5x4	437-490	24.34
6x2	437-528	24.34
6x3	437-530	24.34
6x4	437-532	24.34
6x5	437-534	24.34
8x2	437-578	24.34
8x4	437-582	24.34
8x6	437-585	24.34
10x6	437-626	24.34
10x8	437-628	24.34
12x6	437-668	24.34
12x10	437-670	24.34



For pipe cutters, strap wrenches, deburrers and other tools, see Tool Section.

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## SOLVENT CEMENT & ACCESSORIES

### PVC SOLVENT CEMENT

705 is a clear thixotropic (slow flowing) medium bodied, fast curing, very high strength cement. For Types I and II PVC pipe in sizes through 6" interference fits only. For all schedules and classes except Schedule 80. IAPMO-UPC listed, NSF approved. Meets ASTM D-22564 (see P70 primer). For potable water, pressure pipe, gas, conduit and (D.W.V.) drain, waste and vent. Flows more rapidly than 711 and has better gap-filling properties. Application temperature 40°F to 110 °F.

711 is a gray, heavy bodied, fast-set, high strength cement. For Types I and II PVC in sizes through 12". For all pipe schedules and classes, including Schedule 80. Especially formulated for large sizes and heavy schedules. May also be used for smaller sizes. IAPMO-UPC listed; NSF approved. Meets ASTM D-22564 (see P70 primer). For potable water pressure pipe, gas, conduit, drain pipe, and drain, waste and vent (D.W.V.). Provides a thicker layer of cement on the pipe than 705. Helps to fill gaps in the larger sizes and looser fits. Allows a longer time for assembly. Application temperature 40°F to 110°F.

717 is a gray, heavy-bodied, fast curing, high strength P solvent cement. It is similar to 711 in most respects, but a somewhat slower curing rate, allowing slightly more o time. 717 is formulated for solvent cementing rigid poly chloride (PVC) pipe in all schedules and classes, inclu schedule 80. It has excellent gap filling properties an especially recommended where a sizable gap exists betw pipe and fittings, e.g., in schedule 80 and in large pipe s 717 is used also on small size pipe. Under a damp or condition, this cement will tend to absorb less moisture 711. Excess moisture tends to slow down the cure and re somewhat the ultimate bond strength.

719 is a gray, extra heavy bodied, thixotropic (paste-like) strength PVC Solvent Cement. It provides thicker layer has a higher gap filling property than 711 and 717. I allows slightly more open time before assembly than 71 formulated for joining large size PVC pipe and fittings schedules and classes, including schedule 80. It has lent gap filling properties which are particularly des where a sizeable gap exists between pipe and fitting, i schedule 80, in large pipe sizes and in installation of sa

TYPE	COLOR	PART NUMBER	PRICE				
			GALLON	QUART	PINT	1/2 PINT	1/4 PINT
Pipe sizes thru 6"	Clear	705	33.25	10.15	6.10	3.45	2.35
Pipe sizes thru 12"	Gray	711	41.85	12.80	7.40	4.25	---
Pipe sizes thru 12"	Gray	717	40.85	12.25	7.15	4.15	---
Pipe sizes thru 24"	Gray	719	47.05*	14.20	8.15	---	---

\*Supplied only in TT wide mouth paint type cans without dauber.

### CPVC SOLVENT CEMENT

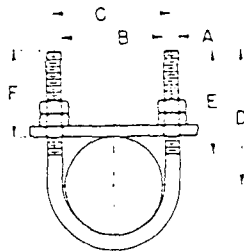
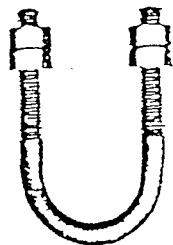
714 is a gray, thick-bodied, medium set cement. For Type IV, Grade 1 CPVC, in sizes through 8". For all schedules. NSF approved. Meets ASTM D-2846. For potable water pressure pipe and industrial systems, cold or hot water (180°F maxi-

mum). Flows freely, moderate gap-filling properties curing. Application temperatures 40°F to 110°F. Store 90°F.

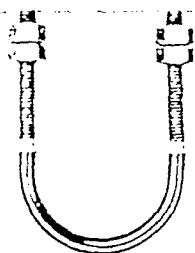
TYPE	COLOR	PART NUMBER	PRICE			
			GAL	QUART	PINT	1/2 PINT
Pipe sizes thru 8"	Gray	714GR	---	12.55	7.15	---
Pipe sizes thru 8"	Orange	714OR	43.50	12.55	7.15	4.40

standard U-bolt  
fig. 137

special U-bolt (non-standard dimensions)  
fig. 137S •



plastic coated: fig. 137C



SIZE RANGE: ½ to 30 inch pipe.

U-bolts

MATERIAL: Carbon steel U-bolt and four finished hex nuts.

FINISH: Black or galvanized; furnished black unless otherwise specified.

SERVICE: Recommended for support, anchor or guide of heavy loads; often employed in power and process plant service.

MAXIMUM TEMPERATURE: 750°F.

APPROVALS: Complies with Federal Specification WW-H-171E (Type 24) and Manufacturers Standardization Society SP-69 (Type 24).

ORDERING FIG. 137: Specify rod size x pipe size (as ½ x 6), figure number, name. U-bolt will be furnished with longer tangents D or with longer threads E if so required and ordered. If hex nuts are not required, specify "without hex nuts."

ORDERING FIG. 137S: Specify figure number, name, material specification, dimensions A, B, C, D and E, and "with hex nuts" or "without hex nuts."

SPECIAL NOTE: When furnished hot-dip galvanized, oversize hex nuts must be used.

fig. 137C coated U-bolt

SIZE RANGE: ½ to 8 inch pipe.

MATERIAL: Carbon steel U-bolt and four finished hex nuts. Formed portion of the U-bolt is plastic coated.

SERVICE: Recommended for support, anchor or guide for glass, copper, brass and aluminum pipe.

MAXIMUM TEMPERATURE: 225°F.

ORDERING: Specify rod size x pipe size (as ¾ x 2), figure number, name. If hex nuts are not required, specify "without hex nuts."

load • weights • packaging • dimensions (inches)

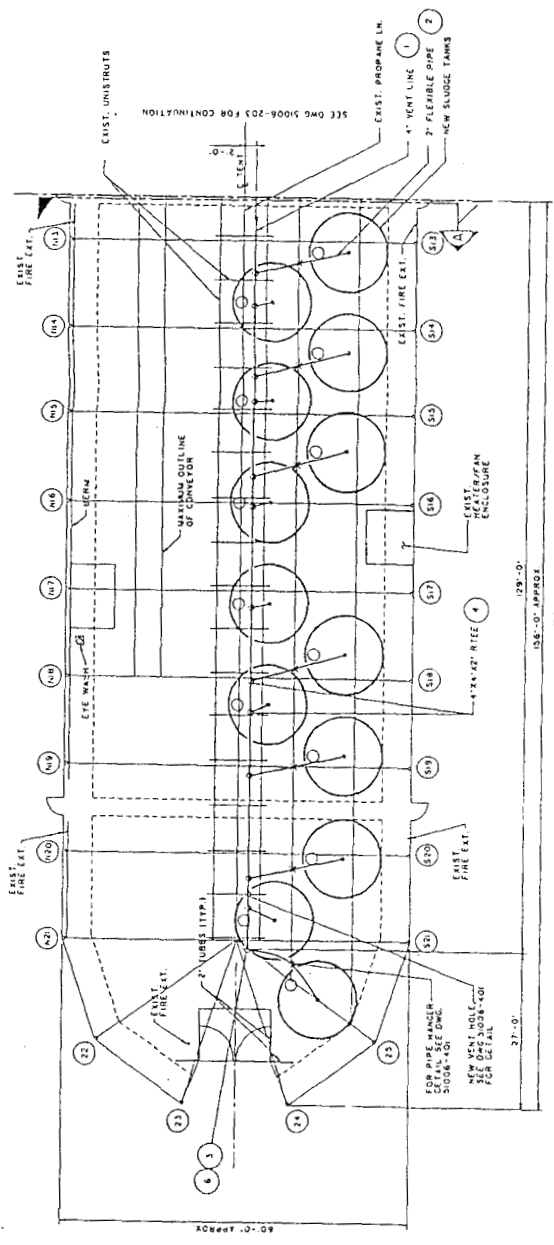
pipe size	rod size A	maximum recommended load, lb•		weight with nuts (approx) lb per 100	no of pieces per carton		B	C	D	E	F
		650°F	750°F		fig. 137	fig. 137C					
½	¼	485	435	11	50	50	1 5/16	1 3/16	2 3/4	2 1/8	2 5/16
¾	¼	485	435	12	50	50	1 1/8	1 3/8	2 3/4	2 1/8	2 7/32
1	¼	485	435	12	50	50	1 3/8	1 5/8	2 3/4	2 1/8	2 3/32
1 ¼	3/8	1220	1090	28	50	50	1 11/16	2 1/16	2 7/8	2 1/8	2 1/32
1 ½	3/8	1220	1090	30	50	50	2	2 3/8	3	2 1/2	2 1/16
2	3/8	1220	1090	33	50	50	2 7/16	2 13/16	3 1/4	2 1/2	2 1/16
2 ½	½	2260	2020	73	50	50	2 15/16	3 7/16	3 3/4	3	2 5/16
3	½	2260	2020	78	50	50	3 9/16	4 1/16	4	3	2 ¼
3 ½	½	2260	2020	84	50	50	4 1/16	4 9/16	4 ¼	3	2 ¼
4	½	2260	2020	90	50	50	4 9/16	5 1/16	4 ½	3	2 ¼
5	½	2260	2020	101	...	15	5 5/8	6 1/8	5	3	2 7/32
6	5/8	3620	3230	197	...	15	6 3/4	7 3/8	6 1/8	3 3/4	2 13/16
8	¾	3620	3230	233	...	...	8 3/4	9 3/8	7 1/8	3 3/4	2 15/16
10	¾	5420	4830	491	...	...	10 7/8	11 5/8	8 3/8	4	3
12	¾	7540	6730	773	...	...	12 7/8	13 3/4	9 5/8	4 ¼	3 ¼
14	7/8	7540	6730	828	...	...	14 1/8	15	10 ¼	4 ¼	3 ¼
16	7/8	7540	6730	915	...	...	16 1/8	17	11 ¼	4 ¼	3 ¼
18	1	9920	8850	1348	...	...	18 1/8	19 1/8	12 5/8	4 3/4	3 5/8
20	1	9920	8850	1457	...	...	20 1/8	21 1/8	13 3/8	4 ¾	3 5/8
24	1	9920	8850	1687	...	...	24 1/8	25 1/8	15 5/8	4 ¾	3 5/8
30	1	9920	8850	1917	...	...	30 1/8	31 1/8	18 5/8	4 ¾	3 5/8

• With minimum safety factor of 5.

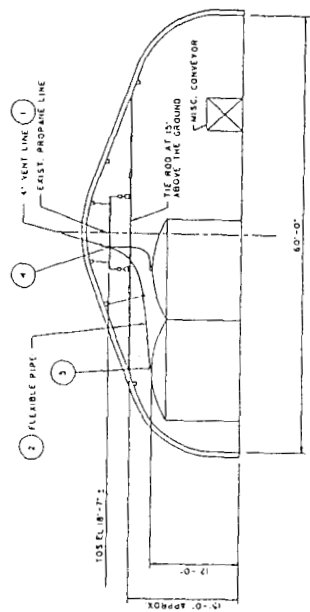
• Loads, weights and dimensions shown do not apply for Fig. 137S.



ITEM	DESCRIPTION
1	140' 4" PIPE SCH. 40
2	220' 2" FLEXIBLE PIPE
3	4" 90° ELL SCH. 40
4	4" 90° ELL SCH. 40
5	4" 90° ELL SCH. 40
6	4" 90° ELL SCH. 40
7	4" 90° ELL SCH. 40
8	4" 90° ELL SCH. 40
9	4" 90° ELL SCH. 40
10	4" 90° ELL SCH. 40
11	4" 90° ELL SCH. 40
12	4" 90° ELL SCH. 40
13	4" 90° ELL SCH. 40
14	4" 90° ELL SCH. 40
15	4" 90° ELL SCH. 40
16	4" 90° ELL SCH. 40
17	4" 90° ELL SCH. 40
18	4" 90° ELL SCH. 40
19	4" 90° ELL SCH. 40
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100	4" 90° ELL SCH. 40



TENT 6  
SCALE: 1" = 10'-0"



SECTION A  
SCALE: 1" = 10'-0"

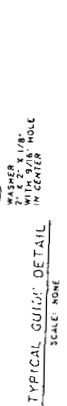
NOTES  
1. FOR PIPE GUIDE, PIPE HANGER, VENT SUPPORT DETAILS  
2. GENERAL NOTES, SEE DWG. S1008-101.

HANGER LEGEND  
X = PH-1 (TYP. 61)  
□ = PH-2 (TYP. 11)

KEYWORDS	ORIGINAL ISSUE	DATE	BY	CHKD	APP'D
ACCELERATED	1	11/11/11	W. J. WILSON		
SLUDGE	2	11/11/11	W. J. WILSON		
VENT	3	11/11/11	W. J. WILSON		
VENT	4	11/11/11	W. J. WILSON		
VENT	5	11/11/11	W. J. WILSON		
VENT	6	11/11/11	W. J. WILSON		
VENT	7	11/11/11	W. J. WILSON		
VENT	8	11/11/11	W. J. WILSON		
VENT	9	11/11/11	W. J. WILSON		
VENT	10	11/11/11	W. J. WILSON		
VENT	11	11/11/11	W. J. WILSON		
VENT	12	11/11/11	W. J. WILSON		
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VENT	16	11/11/11	W. J. WILSON		
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VENT	21	11/11/11	W. J. WILSON		
VENT	22	11/11/11	W. J. WILSON		
VENT	23	11/11/11	W. J. WILSON		
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VENT	90	11/11/11	W. J. WILSON		
VENT	91	11/11/11	W. J. WILSON		
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VENT	96	11/11/11	W. J. WILSON		
VENT	97	11/11/11	W. J. WILSON		
VENT	98	11/11/11	W. J. WILSON		
VENT	99	11/11/11	W. J. WILSON		
VENT	100	11/11/11	W. J. WILSON		

D151006-403





NOTES:

1. INSTALL 3" SUPPORT FLEXIBLE LINES IN SUCH MANNER THAT LINES ARE NOT COATED
2. IF ANY LINE IS FOUND TO BE COATED, IT SHALL BE REWORKED
3. FLEX JOINTS FOR FLEXIBLE LINES SHALL BE MADE IN SUCH MANNER AS TO PROVIDE FOR MOVEMENT OF LINES WITHOUT LEAKING OF FLUID
4. USE 1/2" HANGERS FOR ALL LINES. HANGERS SHALL BE INSTALLED IN SUCH MANNER AS TO PROVIDE FOR MOVEMENT OF LINES WITHOUT LEAKING OF FLUID
5. USE 1/2" HANGERS FOR ALL LINES. HANGERS SHALL BE INSTALLED IN SUCH MANNER AS TO PROVIDE FOR MOVEMENT OF LINES WITHOUT LEAKING OF FLUID
6. CANVAS SLEEVE WITH 1" GASKET ON OUTSIDE WALL AND REINFORCING FABRIC ON INSIDE WALL TO BE INSTALLED ON ALL LINES. SLEEVE SHALL BE INSTALLED ON ALL LINES TO BE CLEANED WITH WATER BEFORE BEING WELDED

SCALE: 1" = 10'-0"

GENERAL SUPPORT DETAIL

HANGER LAYOUT

X PH-1 (TYP 26)  
□ PH-2 (TYP 3)

## DESIGN MODIFICATION PACKAGE

TITLE: ACCELERATED SLUDGE REMOVAL PROJECT (P.N. 989181)  
STORAGE TANK LEAK DETECTION SYSTEMS PACKAGE

DATE OF RELEASE: December 3, 1993

CONCURRENCE:

*12/3/93*  
*[Signature]* (for TQB)  
Thomas d. Beckman, Project Manager

PREPARED BY:

*12/3/93*  
*[Signature]*  
Ronald B. Heitland, Project Engineer

APPROVED BY:

*12/3/93*  
*[Signature]*  
John G. Lehew, Project Engineering Manager

### DISTRIBUTION

Thomas Beckman - Project Manager, Bldg 080  
Joe Mellon - Program Manager, Bldg 080  
Joe Roberts - Operations Manager, T893B  
Scott Kozel - Systems Engineering, T452A  
Dave Chojnacki - Health & Safety, T690C  
Doug Perryman - Health & Safety, T452C  
David Warfield - Facilities Quality Engineering, T130A  
Doug Hughes - Instrumentation & Controls, T130J  
Bob Campbell - Environmental Design Engineering, Bldg 030  
Darrol Crabb - Construction Management, T130F  
Steve Palmrose - J. A. Jones Construction, T690A  
Ken Brusegaard - Cost Estimating, T130D  
Tom Bourgeois - Construction Management, T764B  
Phil Ciullo - DOE/CED, Bldg 116  
Al Smith - Maintenance Planning, T130B

# DESIGN MODIFICATION PACKAGE (DMP) CONTENTS

	DOCUMENT	INCLUDED IN DMP	REF. LOCATION
1.	OBJECTIVE AND TECHNICAL SCOPE		PROJECT FILE
2.	ENGINEERING WORK PLAN		PROJECT FILE
3.	GENERAL ENGINEERING SERVICES SCREEN		PROJECT FILE
4.	AGM APPROVAL LETTER (APPROVAL FOR USE OF COEM PROC. 6.02)		PROJECT FILE
5.	SYSTEMS CLASSIFICATION FORM	X	
6.	ITEM FUNCTIONAL CLASSIFICATION FORM	X	
7.	QUALITY VERIFICATION PLAN	X	
8.	POWER MODIFICATION REQUEST		
	TENT 3		PROJECT FILE
	TENT 4		PROJECT FILE
	TENT 6		PROJECT FILE
9.	WORK GUIDELINES	X	
10.	BILL OF MATERIALS (BOM)	X	
10.	DRAWINGS		
	DWG. NO. 51006-751	X	
	DWG. NO. 51006-752	X	
	DWG. NO. 51006-X52	X	

## SYSTEM CLASSIFICATION FORM

PROJECT NO. 989181 TITLE: ACCELERATED SLUDGE REMOVAL PROJECT  
WORK CONTROL NO. 989181

System Name: TANK LEAK DETECTION SYSTEM

Bldg.: \_\_\_\_\_ Location: 750 PAD, TENTS 3, 4, 6

6.1.1 SYSTEM REFERENCE DOCUMENTS:

OPERATIONAL REQUIREMENTS DOCUMENT

6.1.2 SYSTEM FUNCTIONS AND OPERATING MODES

DETECTS LEAKAGE FROM THE PRIMARY STORAGE TANK.  
TO MEET RCRA REGULATIONS

6.2 SYSTEM CLASSIFICATION (Identify references from those documents listed in Section 6.1.1 and enter technical justification on appropriate space below).

Category 1 ☐ 2 ☐ 3 ☒ 4 ☐

Basis: NO CATEGORY 1 OR 2 SAFETY FUNCTIONS

ARE FULFILLED BY THIS SYSTEM. THE SYSTEM

PROVIDES ADHERENCE TO RCRA REGULATIONS

RONALD B. HEITMAN  
Cognizant Engineer Print Name

Ronald B. Heitman 2862/000174  
Cognizant Engineer Signature ExL/DP

11/29/93  
Date

# ITEM FUNCTIONAL CLASSIFICATION TABLE

Project No. 929181  
 Work Control No. 1  
 Page 1 of 1

Parent System Name: Accelerator Storage Reservoir Project  
TANK LEAK DETECTION SYSTEM

System Category: 1 ☐ 2 ☐ 3 ☒ 4 ☐

NOTE: If component is NSC, all associated parts are NSC and only the classification column (SC/NSC) need be completed.

ITEM NO.	DESCRIPTION OR PART NUMBER	SAFETY FUNCTION	FAILURE MODES	FAILURE EFFECTS	SC/NSC	COMMENTS
1	ALL ITEMS SHOWN ON DWG. NO'S 51006-751, 51006-752, 51006-X52	LEAK DETECTION	1. LEAK DETECTION 2. LEAK DETECTION 3. LEAK DETECTION 4. LEAK DETECTION 5. LEAK DETECTION 6. LEAK DETECTION 7. LEAK DETECTION 8. LEAK DETECTION 9. LEAK DETECTION 10. LEAK DETECTION 11. LEAK DETECTION 12. LEAK DETECTION 13. LEAK DETECTION 14. LEAK DETECTION 15. LEAK DETECTION 16. LEAK DETECTION 17. LEAK DETECTION 18. LEAK DETECTION 19. LEAK DETECTION 20. LEAK DETECTION 21. LEAK DETECTION 22. LEAK DETECTION 23. LEAK DETECTION 24. LEAK DETECTION 25. LEAK DETECTION 26. LEAK DETECTION 27. LEAK DETECTION 28. LEAK DETECTION 29. LEAK DETECTION 30. LEAK DETECTION 31. LEAK DETECTION 32. LEAK DETECTION 33. LEAK DETECTION 34. LEAK DETECTION 35. LEAK DETECTION 36. LEAK DETECTION 37. LEAK DETECTION 38. LEAK DETECTION 39. LEAK DETECTION 40. LEAK DETECTION 41. LEAK DETECTION 42. LEAK DETECTION 43. LEAK DETECTION 44. LEAK DETECTION 45. LEAK DETECTION 46. LEAK DETECTION 47. LEAK DETECTION 48. LEAK DETECTION 49. LEAK DETECTION 50. LEAK DETECTION 51. LEAK DETECTION 52. LEAK DETECTION 53. LEAK DETECTION 54. LEAK DETECTION 55. LEAK DETECTION 56. LEAK DETECTION 57. LEAK DETECTION 58. LEAK DETECTION 59. LEAK DETECTION 60. LEAK DETECTION 61. LEAK DETECTION 62. LEAK DETECTION 63. LEAK DETECTION 64. LEAK DETECTION 65. LEAK DETECTION 66. LEAK DETECTION 67. LEAK DETECTION 68. LEAK DETECTION 69. LEAK DETECTION 70. LEAK DETECTION 71. LEAK DETECTION 72. LEAK DETECTION 73. LEAK DETECTION 74. LEAK DETECTION 75. LEAK DETECTION 76. LEAK DETECTION 77. LEAK DETECTION 78. LEAK DETECTION 79. LEAK DETECTION 80. LEAK DETECTION 81. LEAK DETECTION 82. LEAK DETECTION 83. LEAK DETECTION 84. LEAK DETECTION 85. LEAK DETECTION 86. LEAK DETECTION 87. LEAK DETECTION 88. LEAK DETECTION 89. LEAK DETECTION 90. LEAK DETECTION 91. LEAK DETECTION 92. LEAK DETECTION 93. LEAK DETECTION 94. LEAK DETECTION 95. LEAK DETECTION 96. LEAK DETECTION 97. LEAK DETECTION 98. LEAK DETECTION 99. LEAK DETECTION 100. LEAK DETECTION	NSC		

Prepared By: Handwritten Signature  
 11/29/97  
 Reviewed By: Handwritten Signature

Signature	Name	Date
-----------	------	------



## WORK GUIDELINES

**WARNING:** DO NOT CONNECT POWER TO THE ELECTRICAL PANEL UNTIL ALL LEAK DETECTION UNITS ARE INSTALLED AND CONNECTED.

### **EQUIPMENT CONSTRUCTION:**

#### LEAK DETECTION PANELS

Construct the four leak detection panels according to details "A" and "B" of drawing 51006-752, and follow the internal wiring tables and diagram of drawing 51006-751. Special attention should be given to the number of pilot lamps installed in each panel assembly, since no two panels will serve the same number of tank leak detectors.

Install the fan assembly and the exhaust louver according to the detail on drawing 51006-752.

When wiring the terminal blocks for power to the leak detection units, begin by wiring from the "+" of TB1 (use black wire) to TB1-1, and "-" or TB1 (use white wire) to TB1-2. Continue the wiring using the tables on drawing 51006-751 as a guide.

When wiring the push-to-test pilot lamps connect the first pilot lamp to the "+" (black wire) and "-" (white wire) terminals of TB1, then continue in sequence going from 1LT to 2LT ... to the last pilot lamp assembly in the panel.

#### TRANSMITTER MOUNTING PLATE

Using temporary drawing 51006-X52 as a guide, construct 72 mounting plates for mounting the leak detection transmitters on the tanks. Install the mounting plates using the following sequence:

**WARNING:** Take extra care to insure the primary tank is not cut or damaged during this phase.

**NOTE:** Use drawing 51006-752,, details "C", "D", and "E" for the next steps.

1. Locate the eastern most position on the tank. At the top of the secondary tank mark the position. Then using the mark as a center point, cut the support lip two inches to either side of the original mark.
2. Position a mounting plate center between the open section of the secondary tank's support lip, with the two top holes located 1 inch below the tank lip. Drill three holes for the mounting screws using the mounting plate as a pattern guide.
3. Install the three screws by inserting them through the interior wall of the secondary tank, and then securing the screws with three hex

nuts. Install the mounting plate over the three screws, then secure the plate using three more hex nuts.

#### LEAK DETECTOR INSTALLATION

1. Mount the leak detector on the previously installed mounting plates using detail "C" of drawing 51006-752 as a guide.
2. The leak detector sensors have factory installed cables. The cables will need to be cut to a length that will allow the sensor to rest on the bottom of the tank when connected to the transmitter. Follow the manufacture's guide and drawing 51006-751 when wiring the sensor to the transmitter.

#### FIELD CABLE ROUTING

1. Install messenger wire directly overhead of the detector assemblies mounted on a row of tanks. The wire should run in a east-to-west direction. Attach the messenger wire to the tent ribs using the self tapping screws provided.
2. Using the three conductor BELDEN cable, route the cable up the nearest rib to the nearest unistrut (used to suspend the lamps from), connecting the cable to the rib with the provided wire connectors, and self tapping screws.
3. Route the cable along the unistrut using wire ties to connect to the unistrut every five feet, until the tent rib nearest the destination tank is reached.
4. Follow the rib to the messenger wire, and then route the cable along the messenger wire (using wire ties every three feet to secure the cable to the messenger wire) until the cable is suspended directly over the destination leak detector assembly. Install two cable ties at this point to secure the cable to the messenger wire.
5. Allow the cable to drop in a loop 1 foot below the connection to the leak detection unit. Connect the cable to the leak detector transmitter and at the leak detection panel according to drawing 51006-751.

#### POWER-UP AND TESTING

**NOTE:** Perform a Lockout/Tagout on the associated electrical panel prior to connecting power to the leak detection panel.

1. Connect the leak detection panel to the associated electrical panel/circuit according to drawing 51006-751.
2. Remove the Lockout/Tagout and apply power to the leak detection panel.
3. All lamps will light.

4. At each tank remove the leak detection sensor from the secondary tank, and insert the detector into a bucket of water. The associated pilot lamp at the leak detection panel will go out indicating the system is operational. Remove the leak detector and dry the sensor off. The associated pilot lamp will light.

# Engineering Bill of Material (BOM)

ROCKY FLATS

Revision No. ☒ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐ 18 ☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ 24 ☐ 25 ☐ 26 ☐ 27 ☐ 28 ☐ 29 ☐ 30 ☐ 31 ☐ 32 ☐ 33 ☐ 34 ☐ 35 ☐ 36 ☐ 37 ☐ 38 ☐ 39 ☐ 40 ☐ 41 ☐ 42 ☐ 43 ☐ 44 ☐ 45 ☐ 46 ☐ 47 ☐ 48 ☐ 49 ☐ 50 ☐ 51 ☐ 52 ☐ 53 ☐ 54 ☐ 55 ☐ 56 ☐ 57 ☐ 58 ☐ 59 ☐ 60 ☐ 61 ☐ 62 ☐ 63 ☐ 64 ☐ 65 ☐ 66 ☐ 67 ☐ 68 ☐ 69 ☐ 70 ☐ 71 ☐ 72 ☐ 73 ☐ 74 ☐ 75 ☐ 76 ☐ 77 ☐ 78 ☐ 79 ☐ 80 ☐ 81 ☐ 82 ☐ 83 ☐ 84 ☐ 85 ☐ 86 ☐ 87 ☐ 88 ☐ 89 ☐ 90 ☐ 91 ☐ 92 ☐ 93 ☐ 94 ☐ 95 ☐ 96 ☐ 97 ☐ 98 ☐ 99 ☐ 100

Work Control Number: 989179

Parent System Name: ACCERATED SLUDGE REMOVAL

Page 1 of 1

Item #	Qty.	Item Description	NSR/ SR	Procurement Spec. Number	Rev.	PL
1	4	HOFFMAN ENCLOSURE A-201608LP W/MOUNTING PANEL A-20P16AL	NSR			
2	4	HOFFMAN FAN ASSEMBLY, MODEL 1-PA4AXFN2, 120 VAC	NSR			
3	4	HOFFMAN EXHAUST LOUVER MODEL A-VK44	NSR			
4	4	ACOPIAN 24VDC POWER SUPPLY, 8.5 AMP OUTPUT, MODEL A24H850	NSR			
5	4	FUSE BLOCK, NEWARK MODEL # 27F756, 250 V/15 AMP RATED FOR 3AG FUSES	NSR			
6	4	LITTLE FUSE 3AG SLOWBLOW 10 AMP / NEWARK MODEL # 27F702	NSR			
7	250	TERMINAL BLOCKS, ALLEN BRADLEY MODEL 1492-F1	NSR			
8	4	MOUNTING RAIL, 3 FT. LENGHT, ALLEN BRADLEY MODEL # 1492-91	NSR			
9	16	END ANCHORS FOR TERMINALS, ALLEN BRADLEY MODEL 1492-N23	NSR			
10	72	ALLEN BRADLEY PUSH-TO-TEST PILOT LAMPS W/GREEN CAPS, 22.5 MM 24 VDC AB MODEL 800MR-QT24G	NSR			
11	6	UNISTRUT, 1 5/8" X 1 5/8" CHANNEL, MODEL P-3000-HS	NSR			
12	28	UNISTRUT HEX HEAD CAP SCREWS, 3/8" X 1", MODEL HHCSO37100	NSR			
13	28	UNISTRUT STEEL SPRING NUTS, 3/8" MODEL P-3008	NSR			
14	FT	10,000 FEET OF BELDEN INSTRUMENT AND CONTROL 16 AWG, 3 CONDUCTOR CABLE RATED 300 VOLTS RMS, MEETS NEC ART. 800 FOR NON-CONDUIT USE	NSR			
15	230	SCREWS, 8-32 X 1" CARBON STEEL	NSR			
16	460	HEX NUTS, 8-32 CARBON STEEL	NSR			

# Engineering Bill of Material (BOM)

215018 ROCKY FLATS

Work Control Number: 989179

Page 2 of

Parent System Name: ACCERATED SLUDGE REMOVAL

Category:

Item #	Qty.	Item Description	NSR/ SR	Procurement Spec. Number	Rev.	PL
17	72	CORD CONNECTORS, 90 DEGREE 3/4" HUB W/CABLE SIZE .211 (T&B 2252 **)	NSR			
18	72	CORD CONNECTORS, STRAIGHT 3/4" HUB W/CABLE SIZE .211 (T&B 2530 **)	NSR			
19	72	ADDITIONAL 3/4" HEX NUTS FOR ITEM 18 (T&B 142 **)	NSR			
20	FT	3000 FEET OF 16 GAUGE TIE (MESSENGER) WIRE	NSR			
21	5000	8" ELECTRICAL TIE WRAPS, (T&B TY25M **)	NSR			
22	2000	8 X 5/8" SHEET METAL SCREWS (RYALL ELECTRIC # 76810 **)	NSR			
23	1000	CABLE TIE METAL MOUNT W/SCREW HPLE (T&B 105A **)	NSR			
24	1000	CABLE TIE ADHESIVE MOUNT (T&B 345A **)	NSR			
25	FT	100 FEET OF # 12 AWG (WHITE) THHN WIRE	NSR			
26	FT	100 FEET OF # 12 AWG (BLACK) THHN WIRE	NSR			
27	FFT	100 FEET OF # 12 AWG (RED) THHN WIRE	NSR			
28	FT	20 FEET OF 3/4" RIDGID CONDUIT	NSR			
29	8	3/4" RIDGID CONDUIT TREADLESS CONNECTORS (T&B 8221 **)	NSR			
		** INDICATES ITEM NUMBERS FOUND IN RYALL CATALOG, ANY OTHER VENDOR CAN BE USED.	NSR			

EXTERNAL VIEW  
DETAIL "A"

INTERNAL VIEW  
DETAIL "B"

DETAIL "C"

CROSS SECTION VIEW  
OF OUTER TANK

TOP VIEW OF TANK

DETAIL "F"

[illegible]

NOTES:

CONSTRUCT THE LOW DETECTION PANELS FOR TESTS 3, 4, 6 & 8 IN THE FOLLOWING MANNER:

TEST 3, 4 (ONE, 120 PILOT LAMPS)	1LT THROUGH 28LT
TEST 4 (ONE, 120 PILOT LAMPS)	1LT THROUGH 28LT
TEST 6 (ONE, 120 PILOT LAMPS)	1LT THROUGH 28LT
TEST 8 (ONE, 120 PILOT LAMPS)	1LT THROUGH 28LT

CONSTRUCT THE HIGH DETECTION PANELS FOR TESTS 1, 2, 5, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 80

1	ORIGINAL ISSUE	DATE	10/24/54	BY	100
2	RECEIVED	DATE	10/24/54	BY	100
3	PLACES	DATE	10/24/54	BY	100
4	NAME	DATE	10/24/54	BY	100
5	1. SIGNATURE	DATE	10/24/54	BY	100
6	2. SIGNATURE	DATE	10/24/54	BY	100
7	3. SIGNATURE	DATE	10/24/54	BY	100
8	4. SIGNATURE	DATE	10/24/54	BY	100
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